Part No. OS3-304

OTARI

MTR-90III

MASTER TAPE RECORDER

OPERATION AND MAINTENANCE MANUAL

FOURTH EDITION

Otari, Inc.

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CAUTION

To prevent fire or shock hazard:

Do not expose this unit to rain or moisture.

Do not remove panels (unless instructed to do so).

There are no user-serviceable parts inside.

Refer servicing to qualified service personnel.

PLEASE READ THROUGH THE SAFETY INSTRUCTIONS ON THE NEXT PAGE.

SAFETY INSTRUCTIONS

1.	**Read Instructions**	All safety and operating instructions should be read before the device is operated.
2.	**Retain Instructions**	The safety and operating instructions should be retained for future reference.
3.	**Heed Warnings**	All warnings on the device and in the operating instructions should be complied with.
4.	**Follow Instructions**	All operating and use instructions should be followed.
5.	**Water and Moisture**	The device should not be used near water — for example, near a bathtub, wash bowl, sink, laundry tub, in a wet basement, near a swimming pool, etc.
6.	**Carts and Stands**	The device should be used only with a cart or stand that is recommended by the manufacturer.
7.	**Ventilation**	The device should be situated so that its location or position does not interfere with its proper ventilation. For example, the device should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
8.	**Heat**	The device should be situated away from heat sources such as a radiator, heat register, stove or other appliances (including amplifiers) that produce heat.
9.	**Power Sources**	The device should be connected to a power supply only of the type described in the operating instructions or as marked on the device.
10.	**Grounding or Polarization**	Precautions should be taken so that the grounding or polarization means of the device is not defeated.
11.	**Power Cord Protection**	Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the device.
12.	**Cleaning**	The device should be cleaned only as recommended by the manufacturer.
13.	**Non-Use Periods**	The power cord of the device should be unplugged from the outlet when left unused for a long period of time.
14	**Object and Liquid Entry**	Care should be taken that objects do not enter and that liquids are not spilled into the enclosure through openings.
15.	**Damage Requiring Service**	The device should be serviced by qualified service personnel when: **A.** The power supply cord or the plug has been damaged; or **B.** Objects have entered, or liquid has been spilled into the appliance; or **C.** The appliance has been exposed to rain; or **D.** The appliance does not appear to operate normally or exhibits a marked change in performance; or **E.** The appliance has been dropped, or the enclosure damaged.
16.	**Servicing**	The user should not attempt to service the device beyond what is described in the operating instructions. All other service should be referred to qualified personnel.

COMMUNICATION WITH OTARI

FOR SERVICE INFORMATION AND PARTS

All Otari products are manufactured under strict quality control. Each unit is carefully inspected and tested prior to shipment.

If, however, some adjustment or technical support becomes necessary, replacement parts are required, or technical questions arise, please contact your Otari dealer or contact Otari at:

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Another part of Otari's continuing technical support program for our products is the continuous revision of manuals as the equipment is improved or modified. In order for you to receive the information and support which is applicable to your equipment, and for the technical support program to function properly, please include the following information, most of which can be obtained from the Serial number label on the machine, in all correspondence with Otari:

- Model Number:
- Serial Number:
- Date of Purchase:
- Name and address of the dealer where the machine was purchased and the power requirements (voltage and frequency) of the machine.

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Section 1 Introduction

This section introduces the MTR-90III Tape Recorder and explains the different parts of this manual.

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1.1 The Otari MTR-90III Tape Recorder

The Otari MTR-90III records and reproduces 1" or 2" master tapes in an 8-track, 16-track or 24-track format according to the head assembly and the number of Audio PCB Assemblies. Tension is distributed uniformly across the tape surface by a pair of wide diameter pinchrollerless spindles, the capstan and the tachometer. This design eliminates contact between the tape drive and the oxide, allowing virtually unlimited safe passes of valuable master tapes. Mechanical integrity and long-term stability are ensured by a massive, precision top plate and a unitized, welded steel chassis. The newly designed High Speed Motor Drive Amplifier features self protection and reel-end deceleration for better tape manipulation and more efficient editing. Ultra-high torque DC servo reel motors provide fast winding even with 14" reels, and ensure rapid start-ups to full stable record/play speed. The entire machine is modular in construction, including the computerized transport control logic, for high reliability and serviceability.

The MTR-90III is loaded with convenient features such selection of external speed reference, vari-speed, or 2 crystal-locked speeds—15/30 ips (38/76 cm/s) or 7.5/15 ips (19/38 cm/s). The reels can be gently rocked back and forth for editing with the easy-to-use Cue Wheel or by hand turning the capstan. Push buttons also provide for tension release and retraction of the motor-driven head shields to expedite editing. A practical splicing block and a spot erase function for erasure of unwanted tracks are also provided in front of the head assembly.

The electronics are highly refined. A single PCB Assembly approach has been used for the RECORD/PLAY AUDIO and BIAS PCB Assemblies for each channel simplifying setup and service. Active mixing of audio and bias in the record circuitry, proper utilization of high slew rate IC op-amps, and discrete components at critical stages ensure the cleanest and quietest recordings. There are, of course, individual channel calibrations for bias, low and high speed EQ and gain, and a low and high speed record PHASE COMP trimmer for improving complex waveform characteristics. In addition, a 3 position Master BIAS SELECT switch (with 3 corresponding trimmers) enables the entire machine, once aligned, to be rapidly switched to accommodate the bias requirements of different tapes. For further convenience, a single test input jack applies test/alignment signal to all inputs. There is automatic switching between sync reproduce and input monitor when the machine is switched between play and stop, fast winding modes, and of course Rec/Ready to record enable. Dip switches on the TRANSPORT CONTROL PCB Assembly permit these logic functions to be changed to suit the preference of the user.

Stable ACTIVE BALANCE Circuitry has been used in the input circuit. In the output circuit, balanced or unbalanced operation can be selected. (Transformer output or input may be ordered separately.) In addition, a SERIAL I/O CONNECTOR, conforming to the RS232 standard for direct conversation with a computer, and an Otari Standard Parallel I/O Interface are provided for extended external control.

The model CB-147 Remote Control Unit is included as standard equipment. It features the same transport control buttons as the MTR-90III and provides individual function selections for each channel (Repro/Sel·Rep/Input), master function selections for all channels at once (All Inputs/All Sel·Rep/All Repro), and a master "All Safe" function. Also located on the Remote Control Unit are a Speed Reference Selector switch (VARI, FIX, EXT), a Pitch Control knob, and a Digital Readout indicating speed in percentage or inches per second (ips).

The optional CB-148 Auto Locator with a built-in stop watch attaches to the same stand as the CB-147 and provides independent readouts and controls for the elapsed tape time and locate time. The locator also features zero cue, 10 keyboard assignable memories (keyboard or direct tape time memories) with direct recall, a shuttle function for repeating any desired segment of the tape, and other time saving functions.

The optional EC-101 Plug-in Chase Synchronizer allows the MTR-90III to be controlled via SMPTE/EBU time code for slave operation. With the optional CB-121 Synchronizer Remote Control Unit, the EC-101 can input TC offset as well as monitor master TC, slave TC and difference of time codes.

CAUTION: The DC reel motors develop substantial torque. Never place a hand, clothing or other objects inside, on top or near a reel or swing arm when initiating tape motion. When using the Remote Session Controller or Auto Locator, always make sure anyone near the transport is aware of the potential hazard posed by the high torque motors which are capable of increasing the tape tension very rapidly.

1.2 Using This Manual

1.2.1 Organization

This manual is divided into nine sections beginning with this **Introduction** which contains general information about the machine and about the manual.

Section 2 Installation and Inspection: This section of the manual contains the information required when unpacking and installing the MTR-90III for the first time or when interfacing the machine to a mixing console or other equipment.

Section 3 Controls and Indicators: This section of the manual contains a keyed guide to the controls and indicators and provides detailed information about each control and its functions. This section of the manual should be used whenever a question about the function of a particular control or indicator arises.

Section 4 Operation: This section of the manual describes the operation of the MTR-90III. It contains a list of all the operating modes of the machine and an in-depth description of all MTR-90III operations organized by function. The functional checkouts in **Section 2** should be carefully performed when the MTR-90III is first installed.

Section 5 Maintenance: This section covers the routine maintenance procedures necessary to keep the MTR-90III in peak operating condition.

Section 6 Alignment: This section of the manual covers the information needed to perform the routine alignments and calibrations associated with normal operation of the MTR-90III. You should refer to this section of the manual when performing the normal maintenance and calibration routines that must be done to keep the recorder operating at peak performance.

Section 7 Specifications: This section of the manual contains the operating specifications for MTR-90III series machines.

SECTION 8 Printed Circuit Board Layouts: This section of the manual contains two-color "x-ray" views of major printed circuit boards showing component locations and foil traces.

SECTION 9 Exploded Views and Parts Lists: This section of the manual contains assembly drawings of the machine "exploded" to show internal parts and hardware, and the order of assembly. Each exploded view is keyed to an accompanying parts list showing Otari part numbers and descriptions for all mechanical components.

1.2.2 Conventions Within This Manual

PCB Assemblies: The term PCB Assembly is used in this manual to refer to a printed circuit board which has components (resistors, connectors, etc.) mounted on it. The term PCB or Printed Circuit Board when used alone refers to the "bare" printed circuit board without components. The term PCB is rarely used outside of the electrical and mechanical parts lists. When a PCB Assembly is referred to in the text, the name or function of that PCB Assembly will usually be given in ALL CAPITAL letters.

ALL UPPER CASE: Generally, this manual uses all upper case type to describe a switch or control when that item is similarly labeled on the machine (e.g., the PLAY button).

First Letter: Where a switch or button is not Upper Case labeled or the reference is unclear, only the first letter of the item is capitalized (e.g., the Cue Wheel near the CUE button). Machine status or operating modes are described with an upper case first letter (e.g., you press the PLAY button to place the machine in Play mode).

( ), [ ] - Normal parentheses ( ) are used for examples and parenthetic comments. Square brackets **[ ]** are used to refer to certain illustrations. When used in text, the square brackets are either references to the same figure as noted in that sub-section (e.g., **[3]**, meaning the part labeled "3" in the figure noted) or are preceded by the figure number (e.g., **Fig. 2-1**, **[3]**, meaning "3" in **Figure 2-1**).

Although this manual is intended for 1" 8CH, 2" 16CH and 2" 24CH operations, the following description deals only with 2" 24CH operation. Please note that all explanations apply to 1" 8CH and 2" 16CH as well, even if remarks to that effect cannot be found.

We encourage you to read this manual carefully now, and to again review it after you have had a while to become familiar with the MTR-90III. The more you know about your machine, the more you can benefit from its many versatile features.

Section 2 Installation

Most MTR-90III units are unpacked and tested by local Otari dealers making the following unpacking and checkout procedures unnecessary.

The MTR-90III Recorder, CB-147 Remote Control Unit, logic and power cables, brackets and other related items are shipped partially assembled. Open the crates carefully and save packing materials at least until proper operation has been verified. Connect the power and test the system only after unpacking all components and assembling them according to the instructions.

The MTR-90III weighs approximately 200 kg (400 pounds). At least two strong people should work together during unpacking and the initial setup to avoid physical strain and to ensure gentle handling of the equipment.

IMPORTANT NOTE: If serious problems are apparently caused by shipping damage, whether concealed or obvious, a claim must be filed with the delivering airline, freightline or other carrier, and Otari or the nearest Otari representative must be notified. Retain all packing materials for evidence in damage claims. Failure to do so may weaken any claims! To replace any parts under warranty, obtain a return authorization form from Otari or its representative. **Do not attempt to apply power or operate the machine until proper repairs have been completed.**

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2.1 Inspection

Before making any electrical connections, the equipment should be inspected visually. If there is any evidence of damage due to rough handling in shipping, it is the responsibility of the customer to notify the carrier and submit a claim. Do not connect or attempt to use the MTR-90III or accessories until this inspection has been made.

1. Inspect the equipment for any parts which may have become loose or damaged during shipping.

2. Check the plug-in PCB Assemblies in the card cages:

A. Grasp the top of each door in the front of the MTR-90III and pull to open.

CAUTION! The edges of the doors are very sharp.

B. The upper card cage should contain the proper quantity of Audio boards (i.e., 8, 16 or 24). Eight and sixteen track versions of the MTR-90III will have no cards in slots 9–24 or 17–24 respectively.

C. The lower card cage should contain the POWER SUPPLY PCB Assembly and PCB Assemblies numbered 1–7 installed in the correspondingly numbered card slots.

#1 REEL CONTROL PCB Assembly
#2 CAPSTAN CONTROL PCB Assembly
#3 TRANSPORT CONTROL PCB Assembly
#4 MASTER CPU PCB Assembly
#5 I/O CONTROL PCB Assembly
#6 TAPE COUNTER PCB Assembly
#7 BIAS PCB Assembly

D. Remove the TRANSPORT CONTROL PCB Assembly (#3) and examine DIP switch SW1 (**Figure 2-1**).

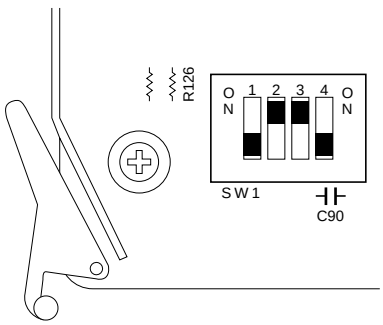

Figure 2-1
SW1 on the TRANSPORT CONTROL PCA

SW1-2 and SW1-3 have been set to the ON position at the factory. These switches are for selecting Stand-by mode. Stand-by mode automatically switches the Output Monitor to Input mode when the following conditions are met: the tape is in Stop or Fast Wind mode, the READY/SAFE switches have been set to the READY position and either the ALL REPRO or ALL SEL·REP button on the Remote Control Unit has been pressed. This mode is called "Stop Stand-by" when entered from the Stop mode and "Fast Stand-by" when entered from Fast Wind modes. SW1-1 and SW1-4 have been set to the OFF position at the factory. When the Master Audio Attenuation Switch (SW4 on the BIAS CONTROL PCB Assembly) is off, audio output is attenuated when the machine is in fast wind modes (see **Figure 2-2** and **Table 2-4**). When SW1-1 on the TRANSPORT CONTROL PCB is off, the Audio output will be attenuated when the CUE button (Lifter Defeat) is pressed during Fast Wind modes. When SW1-1 is on, no audio attenuation will take place when the lifters are defeated.

Table 2-1
SW1 on the TRANSPORT CONTROL PCA

SWITCH	FUNCTION	EFFECT
SW1-1	Hand Cueing Capstan	ON: Defeats Stop Stand-by input switching, allowing audio to be monitored while hand cueing in Stop mode. OFF: Audio output stays in Input mode while in Stop if SW1-2 is on.
SW1-2	Stop Stand-by	ON: Switches to Input monitor in Stop mode.
SW1-3	Fast Wind Stand-by	ON: Switches to Input monitor in Fast Wind mode.
SW1-4	Play Start Inhibit	OFF: Mutes audio output until transport stabilizes at PLAY speed.

SW2 and SW3, which select the head shield functions, are also mounted on the TRANSPORT CONTROL PCB Assembly. The functions of these switches are as follows.

Table 2-2
SW2 and SW3 on the TRANSPORT CONTROL PCA

	0 (OFF)	1 (ON)
SW2	Shield does not move in Fast Wind mode.	Shield retracts in Fast Wind mode
SW3	Independent button control over shields in Unload mode.	Shield retracts in Unload mode.

SW2 and SW3 have been set to 0 and 1 respectively when shipped from the factory.

E. Remove the BIAS CONTROL PCB Assembly (Card #7) and examine DIP switches SW3, SW5 and SW6 (**Figure 2-2**). These switches select the Reproduce and Record EQ for 15 ips (NAB/IEC) and 30 ips (AES/IEC). The switches should be set in accordance with the specifications of the tape in use. See **Figure 2-2** and **Table 2-3**.

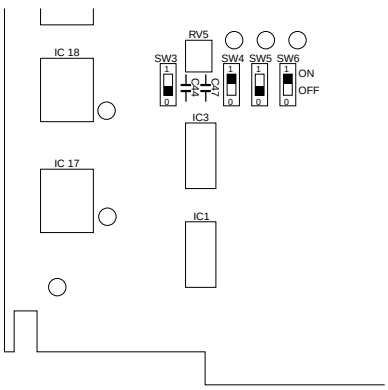

Figure 2-2
Controls on the BIAS CONTROL PCB Assembly

Table 2-3
Reproduce EQ Selection: BIAS CONTROL PCB Assembly

SW3	SW5	SW6	TAPE SPEED	EQ CURVE	TIME CONSTANT
—	—	ON	30 ips	AES	17.4 µs + infinity
—	—	OFF	30 ips	IEC	35.0 µs + infinity
OFF	OFF	—	15 ips	NAB	50.0 µs + 3180 µs
ON	ON	—	15 ips	IEC	35.0 µs + infinity

SW4 is the Master Audio Attenuation Switch and affects the operation of SW1-1 on the TRANSPORT CONTROL PCB Assembly.

Table 2-4
Cue Level Attenuation Selector: BIAS CONTROL PCA

SWITCH POSITION	TAPE SPEED	AUDIO EFFECT AT WIND SPEEDS
SW4 ON	15/30 ips	Not Changed
SW4 OFF	15/30 ips	Attenuated

F. All cards should be firmly seated in their mating connectors and in the correct locations.

G. Close the doors to the card cages.

3. From the front of the machine, check the connectors and components beneath the MTR-90III transport.

A. Remove the 3 allen head cap screws along the slot in the front of the unit just above the VU meter panel. The meter panel is hinged along its lower edge and is held closed by friction from rubber gaskets.

B. Grasp the rail just below the screw holes and gently pull while pivoting the meter panel open until the safety latches hold it in a horizontal position. Do not to drop the panel when pulling it.

C. Check the following connectors to be sure they are firmly mated.

- ❑ The connector on the bracket for each Take-Up reel motor assembly.
- ❑ The 3 connectors located on the head shield retraction mechanism (beneath the head assembly).
- ❑ The connector on the black sensor beneath each swing arm assembly.
- ❑ The connector on the tachometer (beneath the tachometer roller on the Supply side of the transport).
- ❑ The 3 connectors near the tape lifter solenoid (below the head assembly on the Supply reel side).
- ❑ The connectors on the CAPSTAN MOTOR PCB Assembly and the connector which is located below the head assembly near the capstan motor.
- ❑ The 3 connectors on the VU METER PCB Assembly and all the small connectors for the READY-REC LED PCB Assemblies mounted with the VU meters.

D. Check for any obviously loose or damaged components and any cut or broken wires. Then close the meter panel and reinstall the 3 screws removed in Step 3A.

4. From the rear of the machine, check the connectors and components behind the upper card cage.

A. Remove the 6 phillips head screws, dress washers, and nylon washers that secure the edges of the middle panel on the back of the machine (the one with the XLR connectors). The panel is hinged along its lower edge and by gently pulling the top, it will pivot open until its safety latches hold it in a horizontal position.

B. Remove the 4 phillips head screws, dress washers and nylon washers that secure the edges of the top panel on the back of the machine (the one with the fan). This panel is also hinged along its lower edge.

C. Check the following connectors to be sure they are firmly mated.

- ❑ The many connectors located on the back of the upper card cage mother board.
- ❑ On the top panel there are three motor drive transistor assemblies. Each assembly has two large connectors and three small connectors. Check these connectors.

D. The SMPTE-CUE slide switch on the left side of the upper card cage mother board should be set to the "OFF" position. This switch is only used when externally linking the MTR-90III to a suitable SMPTE (Society of Motion Picture and Television Engineers) time code synchronizer. Refer to **§4.2.11**.

E. Check for any obviously loose or damaged components and any cut or broken wires. Then close the middle and top panels and reinstall the phillips screws, dress washers and nylon washers removed in Step 4A.

CAUTION: When closing this back panel, use care to ensure that no wires are pinched between the panel and MTR-90III chassis.

5. From the rear of the machine, check the connectors and components behind the lower card cage.

A. Remove the 4 phillips head screws, dress washers and nylon washers that secure the edges of the bottom panel on the back of the machine (the one with the AC power and logic connectors). Lift the bottom of the panel away from the machine, slide it down an inch so its upper flange clears the hinge screws of the panel above, then set the bottom panel aside. (The electrical connectors are mounted to sub-plates that remain attached to the MTR-90III chassis.)

CAUTION: Be sure the AC power cable is not connected to the MTR-90III at this time.

B. Check the following connectors and components to be sure they are firmly seated.

- ❑ The many connectors located on the back of the lower card cage mother board.
- ❑ The 2 relays on the back of the lower card cage mother board (they should be plugged in and secured with metal retaining clips).

C. Check for any obviously loose or damaged components and any cut or broken wires. Then replace the panel, inserting the upper flange first so it clears the hinge screws of the panel above, and secure it with the 4 screws, dress washers and nylon washers removed in Step 5A.

D. Remove the 5 phillips head screws, dress washers and nylon washes that secure the cover panel on the left side of the chassis. check the several connectors mounted on the DS-1Z Power Supply Assembly for proper engagement.

6. If minor faults or discrepancies are noted during the foregoing inspection procedures, make the necessary corrections and/or adjustments and proceed with the installation.

2.2 Assembly of Remote Control Unit

The Remote Control Unit is provided with a stand for desk top use. The Remote Control Unit can be fitted with the angle adjusting knob for use at any convenient position. Refer to **Figures 2-3** and **2-4**.

❑ **Attaching the ZA-52J Stand Assembly**

1. Remove the two sections of the stand.

2. Assemble the ZA-52J Stand Assembly (**Figures 2-3** and **2-4**).

3. Put the Remote Control Unit gently on the fitting arm and attach the Unit to the arm with the four screws provided.

4. Loosen the knob to adjust the angle. When at the desired angle, retighten the knob to hold the Remote Control Unit secure.

NOTE: THE THICK EDGE OF THE CARRIER BLOCK FACES THE REMOTE CONTROL BOX,. THE FLAT EDGE OF THE BLOCK FACES DOWN.

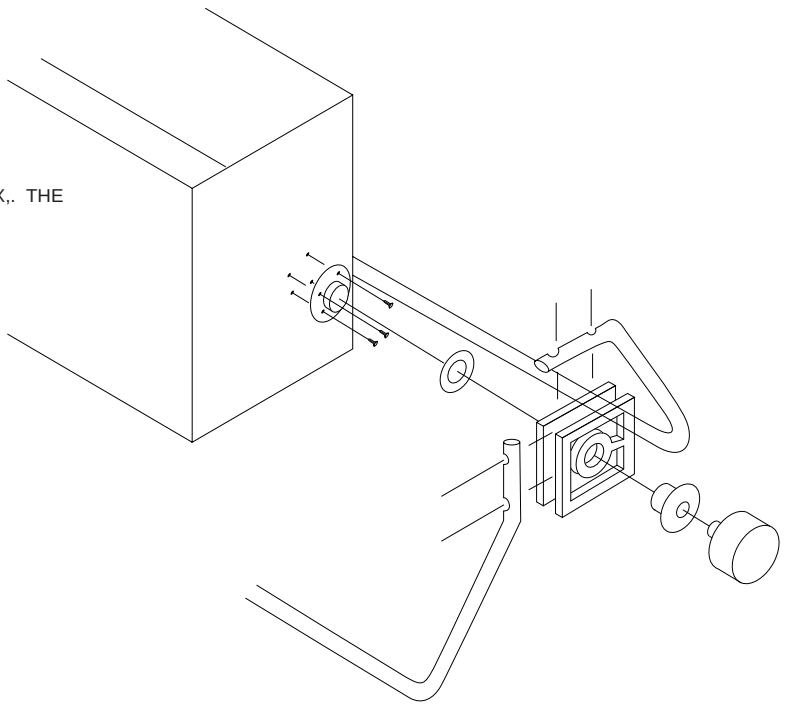

Figure 2-3
Assembling the Mounting Flanges

NOTE: THE THICK EDGE OF THE CARRIER BLOCK FACES THE REMOTE CONTROL BOX,. THE FLAT EDGE OF THE BLOCK FACES UP.

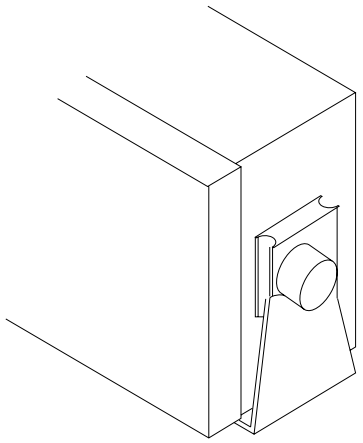

Figure 2-4
Attaching the Stand Assembly

2.3 Stand Assembly (for Remote Control Unit and Auto Locator)

Refer to **Figure 2-5** for the following instructions.

1. Remove the four pieces on the side of the Remote Control Unit.
2. Place the CB-147 Remote Control Unit panel upright on a flat work surface. Connectors should be facing away.
3. Locate the two large aluminum V-brackets. Using 3 allen head cap screws per bracket, attach one V-bracket to each side of the Remote Control Unit.

NOTE: While the brackets are nearly identical, each has the matte finish on different sides. The shiny side of each bracket should rest against the Remote Control Unit, and the leg of the bracket with 2 large holes (not 3) should be attached to the Remote Control Unit.

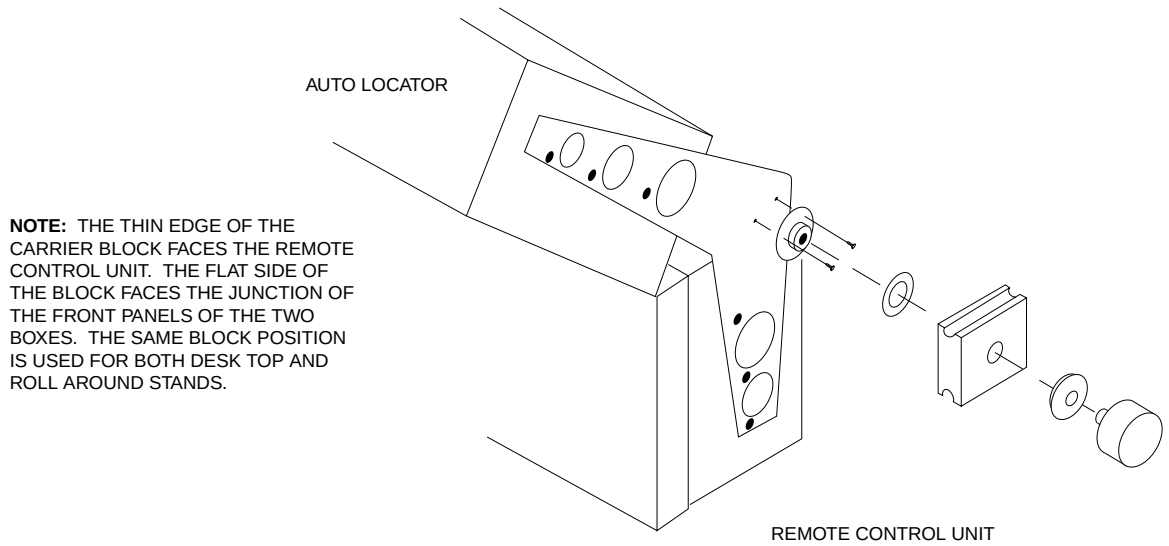
AUTO LOCATOR
NOTE: THE THIN EDGE OF THE CARRIER BLOCK FACES THE REMOTE CONTROL UNIT. THE FLAT SIDE OF THE BLOCK FACES THE JUNCTION OF THE FRONT PANELS OF THE TWO BOXES. THE SAME BLOCK POSITION IS USED FOR BOTH DESK TOP AND ROLL AROUND STANDS.
REMOTE CONTROL UNIT

Figure 2-5
Assembling Auto Locator and Remote Control Unit

4. Locate the 4 brass flanges. Attach the 2 larger mounting flanges to the middle of the two V-brackets (on the matte side) using 3 flat head phillips screws per flange.
5. Set the CB-148 Auto Locator directly on top of the Remote Control Unit between the V-brackets to which it will be secured. Lift the Auto Locator up slightly so that the middle screw hole in the remaining leg of each V-bracket aligns with the corresponding hole in the Auto Locator. Insert one allen head cap screw into each of these holes and partially tighten.
6. Pivot the Auto Locator so that the remaining two screw holes in each bracket align with the holes in the Auto Locator and insert two more allen head cap screws per bracket. Then tighten all the allen head screws to secure the Auto Locator to the bracket.
7. Examine the 2 identical square black carrier blocks. Notice that one side of the part is labeled “A” near the center, and the other “B.” Press the blocks onto the mounting flanges of the V-brackets so the “A” side of each block is adjacent to the V-bracket.
8. Insert the remaining brass bearing flanges in each of the carrier blocks.

9. Insert the threaded screw of each knurled knob through the bearing flange and carrier block and screw it into the mounting flange, but do not tighten.

10. Notice that the carrier blocks are flat on one edge. The carrier blocks should be rotated so that the flat edge faces forward, mid-way between the front panels of the Remote Control Unit and Auto Locator. Refer to **Figure 2-6** or **2-7**. Tighten the knurled knobs.

NOTE: In both illustrations, the carrier block orientation is the same. The flat side is up, and the thinner flange faces the V-bracket.

11. Attach the carrier block to either the mounting rails for desk-top use (**Figure 2-6**) or the optional roll-around stand (**Figure 2-7**).

A. Use 4 flat-head phillips screws to attach each of the two rails to the block as shown in **Figure 2-6**.

B. First fasten the U-bracket to the upright member of the roll-around stand using 3 oval head phillips screws. Then use 2 cap-head allen screws to attach each carrier block to the U-bracket as shown in **Figure 2-6**. The combined Remote Control Unit/Auto Locator/U-bracket/upright assembly can now be inserted in the roll-around base.

12. The Remote Control Unit/Auto Locator assembly can be tilted to any working angle by loosening the knurled knobs, and the locking in place by tightening the knobs.

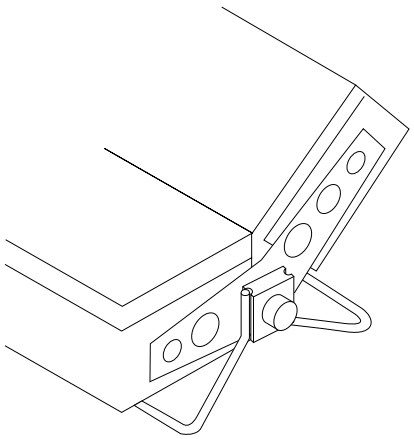

Figure 2-6
Desk Top Stand Assembly

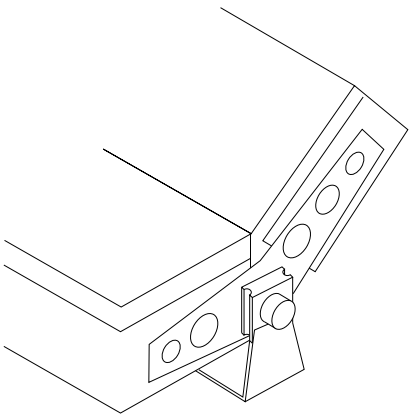

Figure 2-7
Roll-Around Stand Assembly

2.4 Connections

Before connecting cables to the MTR-90III, it is recommend that the 2 rubber bumpers supplied be screwed into two of the 4 corners of the chassis on the rear of the machine (the corners chosen depend on the specific installation). The bumpers help guard cable connectors from inadvertent damage.

2.4.1 Cable Connections

1. Locate and install the following cables supplied with the MTR-90III (there will be 4 cables if the Auto Locator is installed, 3 if not) as shown in **Figure 2-8**. All chassis connectors are clearly labeled with the corresponding functions. BE SURE ALL CONNECTORS ARE POSITIVELY MATED otherwise the tape machine may behave erratically.

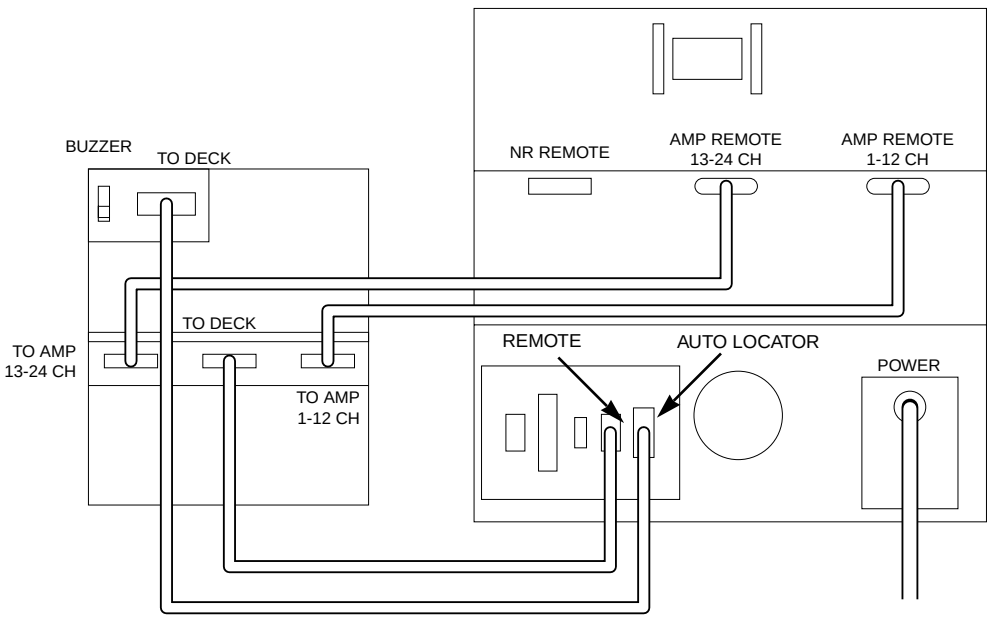

Figure 2-8
MTR-90III Logic and Power Connections

❑ **Remote cable for transport logic:**

(37-pin Cannon D connectors). The female end of the cable plugs into the rear of the MTR-90III, and the male end into the Remote Control Unit. They should then be secured with the two screws supplied.

❑ **Two remote cables for mode switching (CH 1–12 and CH 13–24):**

(50-position AMP connectors). These two cables are identical and have male connectors on both ends. Carry out correct connections taking care not to make mistakes. A clip-lock is attached to the female side (Panel side). Spread the clip fully open, insert the cable, then snap the lock forward to lock the cable in place.

CAUTION: Be sure to follow each cable through from MTR-90III to Remote Control Unit. If a single cable is inadvertently looped between adjacent connectors on the MTR-90III or Remote Control Unit, circuit damage could result. Such damage is not covered by the Otari Warranty.

❑ **Logic cable for optional auto locator:**

(50-pin Cannon D connectors). Insert the male end of this cable into the MTR-90III and the female end into the Auto Locator. Then secure with the two screws supplied.

NOTE: This cable is supplied with the optional CB-148 Auto Locator.

❑ **AC power cord:**

(3-pin mains plug plus threaded 3-pin female connector). Orient the special connector on the cable so its key matches the MTR-90III chassis connector, and insert. Then screw the connector coupling securely to lock the cord in place. Refer to **Figure 2-9** for details on the wiring of the AC power line plug.

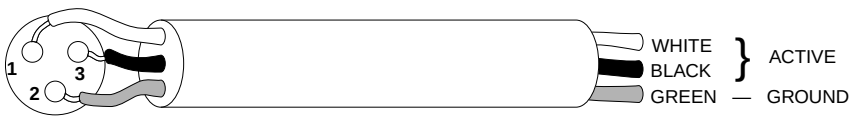

Figure 2-9
AC Power Cord Wiring

CAUTION: Do not plug the other end of the power cable into the AC mains until it is verified that the actual mains voltage meets the specified requirements for the MTR-90III as labeled on its rear panel. Refer to **§2.6** for details on conversion of the power supply. Also, check to make sure the MTR-90III power switch is turned off before plugging in the power cord. This circuit breaker is located on the power supply front panel, behind the left door on the front of the machine and is off when the lever is pressed downward. Refer to **§4.2.1** Step 3 for instructions on powering up the unit.

2. Connect the buss output connectors from the console to the MTR-90III input connectors (10 kΩ load impedance, floating) and the MTR-90III output connectors (5 Ω source impedance, floating) to the line inputs of the console. To avoid hum-inducing ground loops, be sure to follow a sensible grounding scheme such as telescoping shields, e.g., single common ground point (connect shields at the console, not at the tape machine or vice versa, then connect a 12 AWG ground wire from the MTR-90III frame to the console mother board or patch bay ground. A 600 Ω termination of the MTR-90III is unnecessary.

NOTE: Audio connections are made via 2-conductor shielded cables terminated in XLR-type connectors. These cables are not provided with the MTR-90III but are commonly available (standard professional microphone cables) or may be wired as shown in **Figure 2-10**.

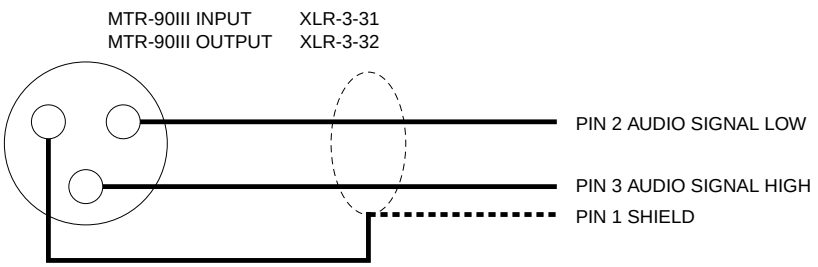

Figure 2-10
XLR Cable Wiring for Audio Connections

2.4.2 NR Remote Connector

When using Noise Reduction equipment, it can be automatically or remotely switched by means of a 50-pin Amp. connector on the MTR-90III (mates with AMPHENOL 57 series 50p plug or equivalent). See **Table 2-5** for pin assignment of this logic connector. Relay contacts only are provided. No positive, negative or ground logic conditions are connected to these relay contacts. One pair of relay contacts per channel is provided, and they close (make contact) when the channel is in Input mode. The contacts are rated at 24 volts DC, 50 milliamperes.

Table 2-5
NR Remote Connector Pin Assignments

CHANNEL	PIN NUMBERS	CHANNEL	PIN NUMBERS
1	1 & 26	13	13 & 38
2	2 & 27	14	14 & 39
3	3 & 28	15	15 & 40
4	4 & 29	16	16 & 41
5	5 & 30	17	17 & 42
6	6 & 31	18	18 & 43
7	7 & 32	19	19 & 44
8	8 & 33	20	20 & 45
9	9 & 34	21	21 & 46
10	10 & 35	22	22 & 47
11	11 & 36	23	23 & 48
12	12 & 37	24	24 & 49
		NC	25 & 50

2.4.3 EXT CLOCK Connector

When the MTR-90III SPEED MODE switch is set to EXT position, the capstan motor speed is capable of being controlled by an external reference signal. The signal is applied via the External Clock connector on the rear of the machine. Specifically, the external clock reference frequency is 9,600 Hz (nominal value for the set 15 ips or 30 ips speed selected). The reference signal should be at TTL level with a 50% duty cycle (i.e., a square wave that is 0 volts when off, +5 volts when on). Refer to **§4.2.11** for further details.

❑ **Jumper Switches on the EXT CONNECTION PCB Assembly**

The Jumper Switches on the EXT CONNECTION PCB Assembly must be set before use. To access the EXT CONNECTION PCB Assembly:

1. Remove the rear connector panel by removing the four securing screws.
2. Remove the bracket with the EXT CONNECTION PCB Assembly (on the left side of the case) by loosening the four M4 screws.

Table 2-6
Jumper Switch Settings on EXT CONNECTION PCA

Jumper	Position	Description
J1 (5V Current)	1-2 (=150 mA) *	The 5V supply current from Pin 20 of the EXT CLOCK connector is output at 150 mA for use with the Otari Standard Parallel I/O Connector.
	2-3 (>150 mA)	For use with Custom Controllers requiring a signal greater than 150 mA.
J2 (Tape Speed Tally)	1-2 (30/15 ips) *	Selects tape speed tallies on the Parallel I/O Connector (high speed version)
	2-3 (15/7.5 ips)	Selects tape speed tallies on the Parallel I/O Connector (low speed version)
J3–J5 (Fast Speed Ref)	J3-J4 (EXT CLOCK)	The EXT CLOCK becomes the source for the capstan control clock. [1]
	J4-J5 (Parallel I/O) *	The Parallel I/O becomes the source for the capstan control clock. [1]

* Factory default settings
[1] Use either the EXT CLOCK connector or the Parallel I/O connector as the source for the capstan control clock. Do not attempt to enter signals from both the EXT CLOCK and Parallel I/O connectors at the same time.

Table 2-7
EXT. CLOCK Pin Assignments

Pin No.	Function	Pin No.	Function
1.	REC TALLY	14.	RWD SWITCH
2.	PLAY TALLY	15.	TACHO OUT
3.	STOP TALLY	16.	9.6K REF.
4.	FF TALLY	17.	GND
5.	RWD TALLY	18.	EXT CLOCK (9.6 kHz nominal)
6.	LIFTER DEFEAT	19.	CAPSTAN TACHO OUT
7.	SMPTE CUE	20.	+5V (150 mA)
8.	SPD REF. VOLT.	21.	FWD/REV (Tape Direction)
9.	SPD COM.	22.	N.C.
10.	REC SWITCH	23.	N.C.
11.	PLAY SWITCH	24.	N.C.
12.	STOP SWITCH	25.	N.C.
13.	FF SWITCH		

2.4.4 Serial I/O Connector

The MTR-90 is provided with an interface function which enables direct conversation with a computer. This function (SERIAL I/O) has the following three capabilities.

(1) RS-232C
(2) CURRENT LOOP
(3) TTL LEVEL

The baud rate can be selected by the Dip Switches located on the I/O Control PCB Assembly as given in **Table 2-7**.

Table 2-8
Baud Rate Settings

BAUD RATE	SWI-1	SWI-2	SWI-3	SWI-4
110 baud	ON	OFF	OFF	OFF
1200 baud	OFF	ON	OFF	OFF
2400 baud	OFF	OFF	ON	OFF
4800 baud	OFF	OFF	OFF	ON

* Factory set to 4800 baud (SW1-4 ON) at the factory.

The SERIAL I/O connector should be connected according to **Table 2-8**.

Table 2-9
Serial I/O Connector Pin Assignments

Pin No.	Function	Pin No.	Function
1.	Frame GND	14.	GND
2.	Transmit Data	15.	RD CNT
3.	Receive Data	16.	RD COM
4.	RTS	17.	TTY OUT
5.	CTS	18.	TTY IN
6.	DSR	19.	TTY COM
7.	(sig) GND	20.	DTR
8.	GND	21.	N.C.
9.	RDR STA	22.	N.C.
10.	TXD	23.	N.C.
11.	RXD	24.	N.C.
12.	DATA BUSY	25.	N.C.
13.	DCD		

For technical information about ASCII Command Characters List, contact Otari or the local Otari dealer. The necessary connector is DC-25P (TRW CINCH) or its equivalent.

2.4.5 Parallel I/O Connector

The Otari Standard Parallel I/O Connector is used for connection with external controlling devices.

Table 2-10
Parallel I/O Connector Pin Assignments

No	Function	Level	In/Out
1.	RECORD Switch	Low	In
2.	PLAY Switch	Low	In
3.	STOP Switch	Low	In
4.	Fast Forward Switch	Low	In
5.	Rewind Switch	Low	In
6.	Lifter Defeat	Low	In
9.	Shut Off Switch	Low	Out
10.	Record Tally	Low	Out
11.	Play Tally	Low	Out
12.	Stop Tally	Low	Out
13.	Fast Forward Tally	Low	Out
14.	Rewind Tally	Low	Out
16.	Signal Ground		
17.	Tach Pulse [1]		Out
18.	Tape Direction (Forward=Low)	H/L	Out
19.	Capstan clock (9.6 kHz fixed)		Out
20.	Capstan Control (9.6 kHz nominal)		In
21.	Tape Speed A [2]	Low	Out
22.	Tape Speed B [2]	Low	Out
28.	Fast Wind Speed Control Voltage	0-15V	
29.	Fast Wind Speed Control Command	Low	In
30.	TC Track Repro Enable	Low	In
32.	Record Rehearsal Command	Low	In
33.	+5 V Regulated (max. 150 mA)	±10%	
34.	Aux Power } (unreg 24 ~ 40 V max. 500 mA)		
35.	Aux Power }		
36.	Power Ground		
37.	Power Ground		

[1] Speed	Rate
7.5 ips	20 pulse/sec
15 ips	40 pulse/sec
30 ips	80 pulse/sec

[2] Speed	Speed A	Speed B
7.5 ips	Low	High
15 ips	High	Low
30 ips	High	High

2.5 Power Supply Conversion

❑ **Voltage Conversion**

When the machine is used at a different voltage, the connection plug for the power supply needs to be rewired. To change the wiring, remove the bottom section of the back panel to expose the voltage selector plug (white nylon connector) to the “L” bracket on top of the right chassis frame. Change the wiring of the connector in accordance with the power supply circuit diagram, or insert a new connector for new voltage.

❑ **Frequency Conversion**

When the machine is used at a different AC line frequency, the voltage supplied to the cooling fan must be changed because the efficiency of the cooling fan is determined by frequency. To change the voltage to the fan, remove the left side panel of the machine. The conversion switch is found on the side of the power supply box located at the top right. Set the switch to the line frequency to be used.

Section 3 Controls and Indicators

This section describes the controls, indicators and connectors on the MTR-90III Tape Recorders, the CB-147 Remote Control Unit and on the optional CB-148 Auto Locator.

3.1 Transport Controls and Indicators 3-2

3.2 Rear Panel 3-5

3.3 Remote Control Unit (CB-147) 3-7

3.4 Auto Locator (CB-148) 3-10

3.1 Transport Controls and Indicators

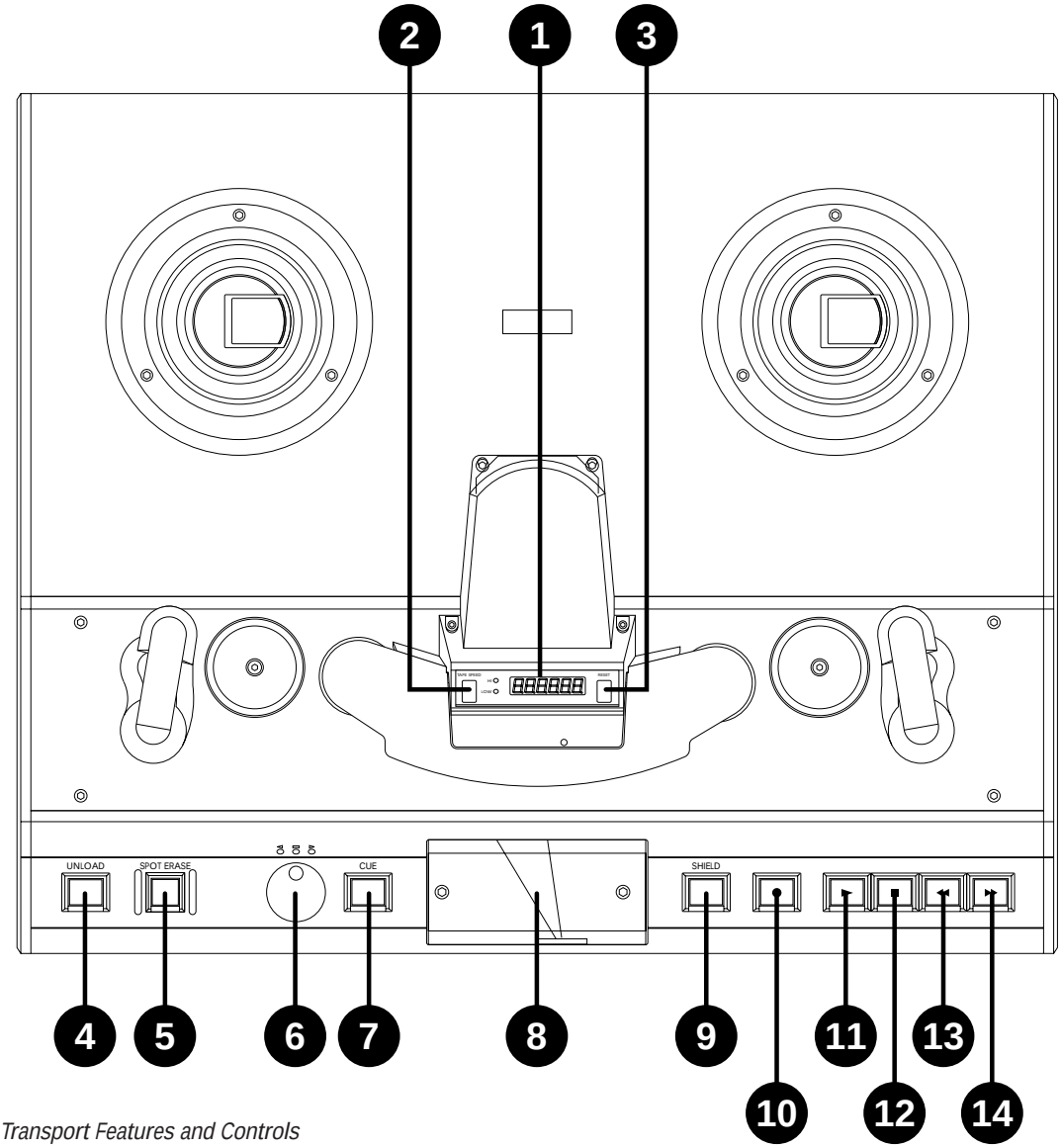

Figure 3-1
MTR-90III Transport Features and Controls

NOTE: Numbers in brackets **[ ]** refer to **Figure 3-1**.

The transport buttons glow dimly while power is on. When power is first turned on, the UNLOAD button **[4]** is brighter than the other buttons.

[1] Tape Time Display

The Tape Time Display shows the current tape time.

- ❑ **Resetting the Tape Time Display:** Press the RESET button **[3]** to reset the Tape Time Display.

[2] TAPE SPEED Button/Indicators

This button selects the desired tape speed. The current speed is indicated by the adjacent TAPE SPEED indicators. HI speed is 30 ips (76 cm/s) and LOW speed is 15 ips (38 cm/s) (on some models 15 ips/7.5 ips).

[3] RESET Button

Pressing this button will reset the Tape Time Counter Display **[1]** to zero. This button does not reset the Tape Time Readout (**§3.4**, **[1]**) on the optional Auto Locator.

[4] UNLOAD Button

When this button is pressed while the transport is in Stop mode, the reel servos shut off and the head shields retract so the reels can be turned manually.

[5] SPOT ERASE Button

This button is used to erase unwanted tracks. Refer to **§4.2.9** for a detailed description on using the Spot Erase mode.

[6] Cue Wheel/Indicators

The Cue Wheel controls the direction and speed of tape motion in Cue mode. The indicators show the direction of tape motion. (See **[7] CUE Button** for further explanation.)

[7] CUE Button

The button is used to enter Cue Mode. When pressed, it illuminates brightly. There are two main modes.

- **Normal Cue Mode:** When the CUE button is pressed while the transport is in Stop mode, the direction and speed of tape motion are determined by the Cue Wheel **[6]**.
- **Fast Cue Mode (Lifter Defeat):** When the CUE button is pressed while the transport is in Fast Forward or Rewind mode, the tape lifters are retracted so the tape can be monitored. The lifters remain retracted for as long as the button is pressed; releasing the button clears Fast Cue mode.

CAUTION: Be sure the monitor amps are turned off or the volume is down, otherwise the loudspeakers could be damaged. The volume level of the monitor speaker can be attenuated by setting SW4 on the BIAS CONTROL PCB Assembly. Refer to **Table 2-4** in **§2.1** for details.

[8] Splicing Block

This built-in splicing block is convenient for use during editing.

[9] SHIELD Button

This button is used to control the raising and lowering of the Head Shield.

[10] RECORD Button

This button is used to enter the Transport into Record mode when pressed together with the PLAY button **[11]** or while the machine is in Play mode. Individual channels will not actually record, however, unless they have been set to Ready mode.

- When the RECORD button is pressed, it becomes brightly illuminated, and the blinking Ready/Safe indicators will remain steadily illuminated, indicating that the channels are recording.
- **Exiting Record Mode:** There are three ways to exit Record mode.

  a. To exit Record on a single channel without stopping the tape, move its READY/SAFE switch (**§3.3, [10]**) to the Safe position. The Ready/Safe indicator above that switch should turn off.

  b. To exit Record mode on all channels without stopping the tape (i.e., continuing in Play mode), press the PLAY button **[11]**. The RECORD button illumination will dim, and the Ready/Safe indicator(s) will begin flashing again.

  NOTE: This method is recommend over pressing the ALL SAFE button.

  c. To exit Record mode and stop the tape, press the STOP button **[12]**.

[11] PLAY Button

This button is used to enter the Transport into Play mode. When this button is pressed, the tape is reproduced in the forward direction (from Supply to Take-up reel) at the selected speed.

- **Entering Record Mode:** When this button is pressed with the RECORD button **[10]**, the Transport enters Record mode.

[12] STOP Button

This button is used to stop tape motion.

- **Exiting Record Mode:** Press this button to exit Record mode and stop the tape.
- **Loading:** Press this button when slack is present in the tape path (after unloading or when threading the tape) to activate the servos. The STOP button illuminates.

[13] Rewind (RWD) Button

This button is used to wind the tape from Take-up reel to Supply reel at Fast Wind speed (Rewind).

[14] Fast Forward (F.FWD) Button

This button is used to wind the tape from Supply reel to Take-up reel at Fast Wind speed (Fast Forward).

3.2 Rear Panel

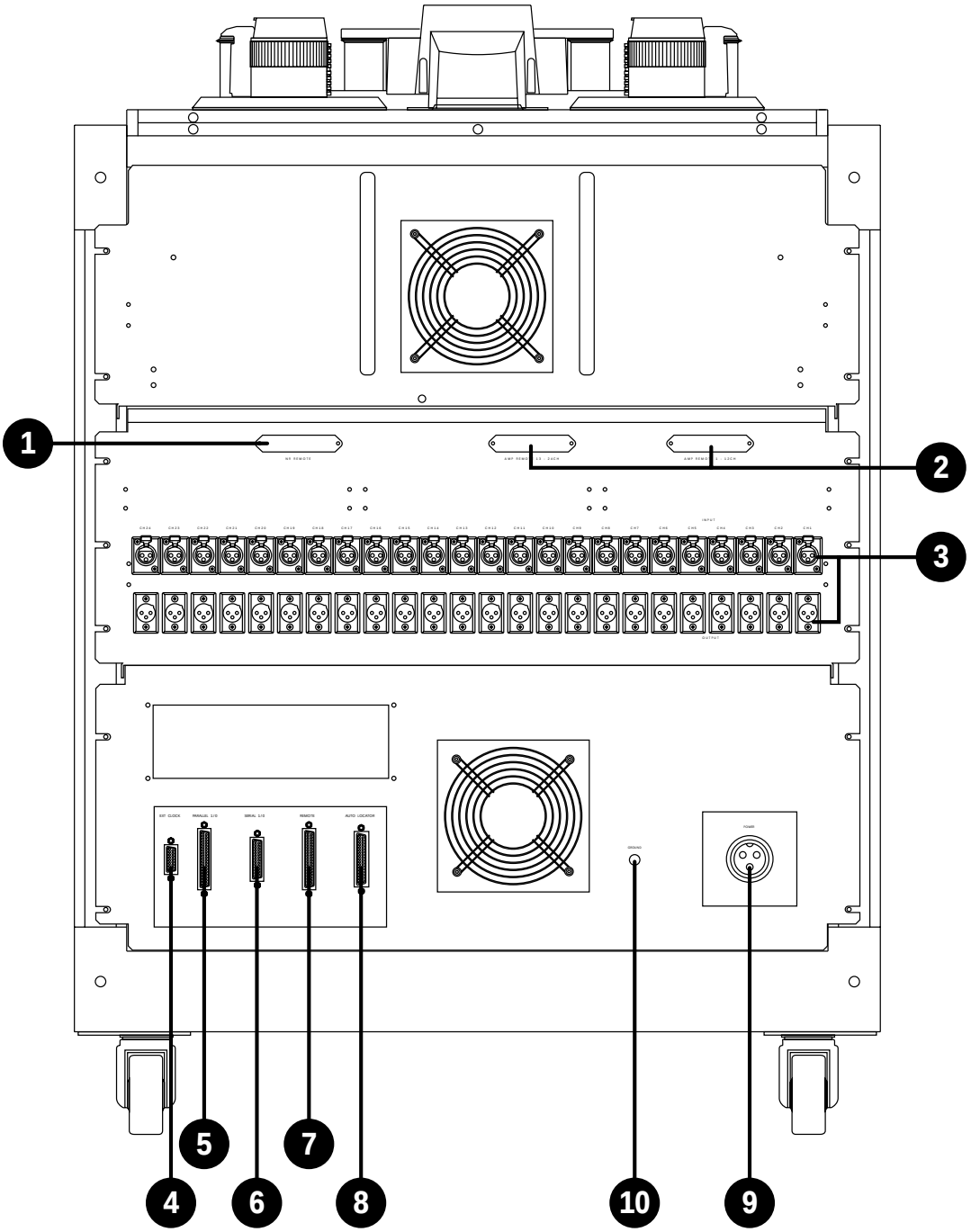

Figure 3-2
Rear Panel Features

NOTE: Numbers in brackets **[ ]** refer to **Figure 3-2**.

[1] NR REMOTE Connector — This connector is used to provide mode control of any non-simultaneous external noise reduction system which requires machine control of Encode/Decode modes.

[2] AMP REMOTE Connectors — This connector is used to connect the optional Amplifier Remote Controller.

[3] Audio Input/Output Connectors — Connectors for audio input and output.

[4] EXT CLOCK Connector — Used to connect an external reference clock to control the capstan speed of the MTR-90III.

[5] PARALLEL I/O Connector	This is a standard Otari parallel I/O interface connector.
[6] SERIAL I/O Connector	These connectors provide serial remote control of transport and audio channel modes.
[7] REMOTE Connector	This connector is used for Remote Controllers (e.g., CB-147).
[8] AUTO LOCATOR Connector	This connector is used for the CB-148 Auto Locator.
[9] POWER Connector	This connector is the AC power input connector.
[10] GROUND Terminal	This is the ground terminal.

3.3 Remote Control Unit (CB-147)

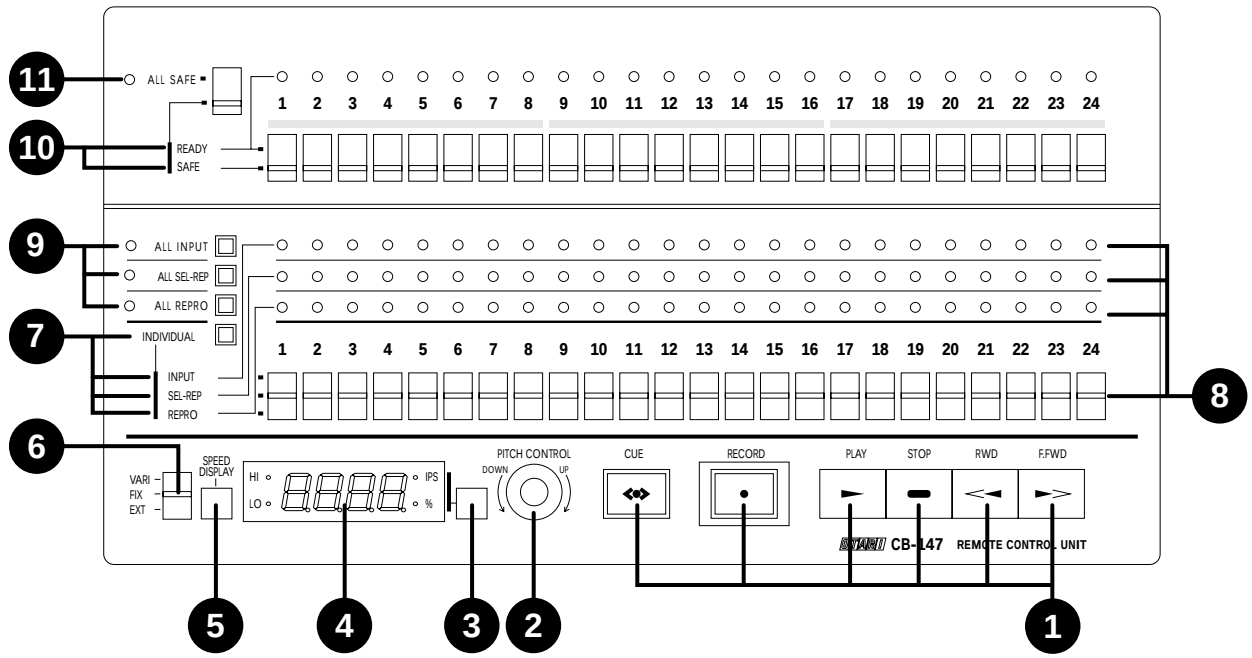

Figure 3-3
Remote Control Unit Features

NOTE: Numbers in brackets **[ ]** refer to **Figure 3-3**.

[1] PLAY/STOP/RWD/F.FWD/RECORD/CUE Buttons

These buttons have the same function as the corresponding buttons on the MTR-90III (see **§3.1**).

- ❑ The CUE button on the Remote Control can be used only for Lifter Defeat.

[2] PITCH CONTROL Knob

The PITCH CONTROL knob is used to vary the tape speed from the selected tape speed over a range of approximately ±20% when the Speed Mode switch **[6]** has been set to VARI. The varied tape speed can be displayed on the Speed Display screen **[4]** when the SPEED DISPLAY button **[5]** has been pressed.

[3] %-IPS Button/Indicators

This button switches the Speed Display screen **[4]** between inches per second (ips) and percentage of the selected tape speed (%). The appropriate indicator will illuminate to indicate which mode has been selected.

[4] Speed Display Screen/Indicators

This four digit speed display screen shows the current tape speed in either ips or percentage of the change from the selected speed as determined by the %-IPS Switch **[3]**. The SPEED DISPLAY button **[5]** must be first pushed to view this variation. This screen also contains the HI-LO indicators for showing the selected tape speed.

[5] SPEED DISPLAY Button

The SPEED DISPLAY button is used to turn the Speed Display screen **[4]** on and off.

[6] Speed Mode Switch

The Speed Mode switch gives a choice of three references for tape speed control.

- ❑ **FIX Mode:** The capstan speed is fixed by reference to an internal crystal oscillator at either 15 ips (38 cm/s) or 30 ips (76 cm/s) selected by the TAPE SPEED button (**§3.1**, **[2]**) on the MTR-90III.

- ❑ **VARI Mode:** The capstan speed can be varied through a range of just over ±20%, almost four musical steps, as set by the adjacent PITCH CONTROL knob **[2]**. The speed variation is indicated on the Speed Display screen **[4]** in percent or ips. The SPEED DISPLAY button **[5]** must be pushed to view this variation. The speed is varied from the speed set by the TAPE SPEED button (**§3.1**, **[2]**) on the MTR-90III.

- ❑ **EXT Mode:** The capstan speed can be varied by reference to an external oscillator, synchronizer, etc.

[7] INDIVIDUAL Button

When the INDIVIDUAL button is engaged, the 3-position Output Selector Switches **[8]** independently determine the signal source for each of the MTR-90III channel output amplifiers, VU meters, and output jacks unless the channel is in Ready mode. The individual channel switches can be overridden by the master ALL INPUT, ALL SEL·REP or ALL REPRO buttons.

[8] Output Selector Switches/Mode Indicators

These 3-position switches select the source for the output signal. The column of 3 LEDs above each switch indicates the selected status.

- ❑ **INPUT Mode:** With the Output Selector switches set to the INPUT position (lever up), the input electronics, not the tape, are monitored whether the machine is in Stop, Play or Record mode. The amber indicator (top row) for the channel illuminates.

- ❑ **SEL·REP Mode:** With the Output Selector switches set to the to the SEL·REP position (lever centered), the channel output consists of the tape playback picked up with the record head and amplified via the sync amp for that channel. The green indicator (middle row) for the channel illuminates.

- ❑ **REPRO Mode:** With the Output Selector switches set to REPRO position (lever down), the output signal is playback driven from the reproduce head and reproduce electronics. The corresponding amber indicator (bottom row) should be illuminated.

[9] ALL INPUT/ALL SEL·REP/ALL REPRO Buttons

When switching all channels to one of the three possible modes, the master ALL INPUT, ALL SEL·REP or ALL REPRO push buttons can be used instead of the 24 Output Selector switches. These buttons override the individual Output Selector Switches **[8]**.

- ❑ **All Input Mode:** When the ALL INPUT button has been pressed, all of the channels enter Input mode, and the amber indicator to the left and all 24 amber LEDs to the right of this button illuminate. See **Table 3-1**.

- ❑ **All Sel·Rep Mode:** When the ALL SEL·REP button has been pressed, all of the channels are set into Sel·Rep mode, and the green indicator to the left and the green LEDs to the right (middle row) or the amber LEDs (top row) illuminate, depending on whether the machine is in Stop, Play or Record mode and on the Ready/Safe status of the individual channels. See **Table 3-1**.

- ❑ **All Repro Mode:** When the ALL REPRO button has been pressed, all of the channels are set into Repro mode, and the amber indicator to the left and the amber LEDs to the right (bottom row) or the amber LEDs (top row) illuminate, depending, as in the case of the ALL SEL·REP button, on whether the machine is in Stop, Play or Record mode and on the Ready/Safe status of the individual channels. See **Table 3-1**.

[10] READY/SAFE Switches/Indicators

These 2-position switches are provided for setting individual channels in Record Ready or Record Safe mode. The red indicators above illuminate when that READY/SAFE switch is set to READY, indicating that the corresponding channel is ready for recording. The READY/SAFE switches can be overridden by the ALL SAFE switch **[11]**.

NOTE: There is a functional interaction of the READY/SAFE switches **[10]** and the output select switches. The output status and indicator indicators also change in some cases, as noted, when the machine is switched between Stop and Play modes.

[11] ALL SAFE Switch/Indicator

This switch is used to select between putting all channels in Record Safe mode all at once or allowing the mode to be selected by the READY/SAFE switches **[10]** on the individual channels.

- ❑ Setting this switch to the ALL SAFE position puts all channels into Record Safe mode and illuminates the adjacent red ALL SAFE indicator. In All Safe mode, the individual READY/SAFE switches for each channel have no effect and the indicators above them should be off.
- ❑ When ALL SAFE is not selected, the Record Ready status of each channel is determined by its READY/SAFE switch.

Table 3-1
Table of Monitor Output Modes

Output Mode	Ready/ Safe	Transport Mode			
		Stop	**Play**	**Record**	**Fast Wind**
Sel·Rep	**Ready**	Input[1]	Sel·Rep	Input	Input[2, 3]
Sel·Rep	**Safe**	Sel·Rep	Sel·Rep	Sel·Rep[4]	Sel·Rep
Repro	**Ready**	Input[1]	Repro	Repro	Input[2, 3]
Repro	**Safe**	Repro	Repro	Repro[4]	Repro
Input	**Ready**	Input	Input	Input	Input
Input	**Safe**	Input	Input	Input[4]	Input

[1] Stop Standby mode.
[2] Fast Standby mode.
[3] Pressing the Cue button places the transport into Sel·Rep mode.
[4] No recording can take place while the transport is in Safe mode.

3.4 Auto Locator (CB-148)

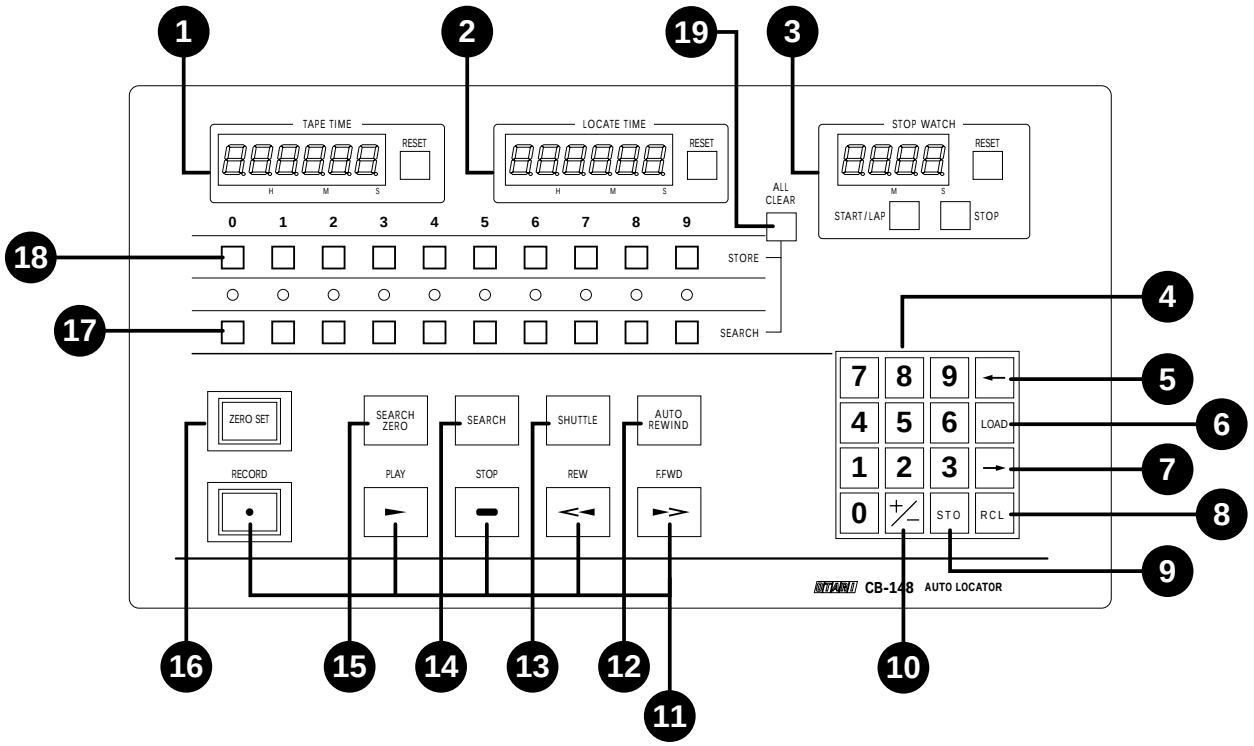

Figure 3-4
Auto Locator Front Panel Features

NOTE: The CB-148 Auto Locator is an option. It should be installed as detailed in **§2.3** and **§ 2.4**. Numbers in brackets **[ ]** refer to **Figure 3-4**.

The function buttons **[11]** have 2-level illumination: dim (normal) and bright (when selected). The 10-Key Pad **[4]** and the related buttons **[5]**–**[10]** do not illuminate.

[1] TAPE TIME (Tape Time Readout/Reset Button)

The Tape Time readout displays the elapsed time of the tape relative to the same zero point shown on the MTR-90III Tape Time Counter display (**§3.1**, **[1]**) or any other point on the tape such as the beginning of a take. The Tape Time readout is also provided with a minus sign at the head of digital readouts when the elapsed time diminishes from 0.00.00, that is, just before 0.00.00, -0.00.00 is displayed. The same applies to LOCATE TIME **[2]**.

- ❑ **Resetting the Tape Time Readout:** Press the RESET button adjacent to the Tape Time readout to reset the Tape Time readout.
- ❑ **Offsetting the Tape Time Readout:** To offset the Tape Time readout from the MTR-90III Tape Time Counter display, select a Locate Time and press the Shift Left button **[5]**.
- ❑ **Correlating the Tape Time Readout:** To correlate the Tape Time with the MTR-90III Tape Time Counter display, press the LOAD **[6]** or SEARCH ZERO button **[15]**.

[2] LOCATE TIME (Locate Time Readout/RESET Button)

The Locate Time readout displays the tape time destination when the SEARCH **[14]**, SHUTTLE **[13]**, or AUTO REWIND **[12]** buttons have been pressed. The Locate Time readout is also provided with a minus sign at the head of digital readouts when the elapsed time diminishes from 0.00.00, that is, just before 0.00.00, -0.00.00 is displayed.

- **Entering Locate Times:** There are three methods for entering Locate Time.
  1. Locate Times can be entered directly from the 10-Key Pad **[4]**.
  2. Locate Times can be recalled from previously stored cues using the RCL button **[8]** and a number on the 10-Key Pad **[4]**.
  3. Locate Times can be "copied" from the Tape Time readout by pressing the Shift Right button **[7]**.
- **Resetting the Locate Time Readout:** Press the RESET button adjacent to the Locate Time readout to reset the Locate Time.

[3] STOP WATCH (Stop Watch Readout/START LAP Button/STOP Button/RESET Button)

The Stop Watch is independent and has no interaction with other Auto Locator or MTR-90III functions. The readout displays up to 99M59S.

- **Starting the Stop Watch:** When the transport is in Stop mode, press the START LAP button under the Stop Watch readout to start the watch.
- **Taking Lap Times:** When the START LAP button is pressed a second time, the lap time (the time at the instant the button is pressed) is displayed. To return to the elapsed time count, press START/LAP again.
- **Stopping the Stop Watch:** Press the STOP button located next to the START LAP button to stop the counting and display the final time. If STOP is pressed while a lap time is displayed, the readout will change and display the final time.
- **Resetting the Stop Watch:** Press the RESET button adjacent to the Stop Watch readout to reset the Stop Watch. If the RESET button is pressed while the watch is counting, the count will be stopped.

[4] 10-Key Pad

These keys are used to enter Locate times or a Cue point memory register numbers. The 10-Key Pad is temporarily disabled while the machine is performing a Search, Search Zero, Shuttle or Auto Rewind function.

- **Clearing Cue Memories:** By entering a Locate Time of 0.00.00 and pressing STO and a number for a Cue Memory, that Cue memory will be cleared (0.00.00 will be stored).

NOTE: It is impossible to enter a Locate Time with a numeral of 6 or higher in the second digit from the right since this would be 60 or more seconds.

[5] SHIFT LEFT Button (◄—)

This button transfers the time shown on the Locate Time readout **[2]** to the Tape Time readout **[1]**.

[6] LOAD Button

The LOAD button changes the Tape Time readout to display the same tape time shown on the MTR-90III Tape Time Counter Display (**§3.1**, **[1]**). In other words, it resets the Auto Locator Tape Time to correspond to the actual time shown on the transport.

[7] SHIFT RIGHT Button (→)

This button transfers the time shown on the Tape Time readout **[1]** to the Locate Time readout **[2]**.

NOTE: Tape Time can be stored "on the fly" while the tape is playing or recording by pressing SHIFT RIGHT at the exact instant to be recorded and then pressing STO followed by a numeric address.

[8] RCL Button

This button is used to retrieve times previously stored and display it in the Locate Time readout. When the machine is first turned on, all addresses are initialized to 00M00S

- **Recalling Cue Points:** To recall a given cue point, press the RCL button and then press the number on the 10-Key Pad **[4]** (0–9) which identifies the address where the time is stored. The time will be displayed on the Locate Time readout **[2]** and will also remain in memory. Repeat to recall another cue. It is not necessary to reset the readout since the recalled time will replace any previously displayed Locate Time.

[9] STO Button

This button is used to memorize the time displayed on the Locate Time readout **[2]**. Up to ten different times can be memorized at once. Memory is volatile, meaning it is not saved after the power is turned off.

- **Storing Cue Points:** To store a given cue point, display the time in the Locate Time readout either by direct entry with the 10-Key Pad **[4]** or by using the SHIFT RIGHT button **[12]**. Press the STO button and then press a number on the 10-Key Pad (0–9) **[4]**. The number pressed becomes the "address" where the Locate Time is stored. To store a second cue, repeat using a different address. If the same address is used, the previously stored time will be erased.

- **Clearing Cue Memories:** By entering a Locate Time of 0.00.00 and pressing STO and a number for a Cue Memory, that Cue memory will be cleared (0.00.00 will be stored).

[10] +/– Button

When this button is pressed once, a minus (–) appears at the head of the Locate Time readout. When pressed again, a plus (+) sign appears.

[11] RECORD/PLAY/STOP/RWD/F.FWD Buttons

These buttons essentially duplicate the functions of their counterparts on the MTR-90III Transport (**§3.1**) and Remote Control Unit (**§3.3**). The only difference is that when using Search, Search Zero, Shuttle, and Auto Rewind modes, the Auto Locator PLAY and/or RECORD buttons can be pressed without affecting the selected Auto Locator mode; pressing the RECORD or PLAY buttons on the MTR-90III or Remote Control Unit will override the Auto Locator function.

[12] AUTO REWIND Button

AUTO REWIND is similar to Shuttle **[13]**, except the tape will play to the Locate Time, rewind and stop at the point where the AUTO REWIND button was first pressed rather than continue the play/rewind cycle.

[13] SHUTTLE Button

Pressing the SHUTTLE button causes the MTR-90III to "remember" the current Tape Time displayed on the readout and to enter (or continue in) Play mode until the Locate Time is reached. Then the tape automatically rewinds to the point where SHUTTLE was first pressed and plays again. This cycle continues until Shuttle mode is exited. Shuttle mode is helpful for playing a section of an alignment tape, for rehearsing a particular segment of a tune, and so forth.

NOTE: These explanations assume that the Locate Time is greater than the displayed Tape Time. If not, the SHUTTLE will enter Reverse Shuttle mode stopping the tape when the button is pressed and rewinding the tape to the time displayed in the Locate Time display and then going into Play mode and repeating this cycle until cancelled.

- ❑ **Starting Shuttle Mode:** Enter a Locate Time (ahead in time) for the end point of the shuttle operation. Move the tape to the point where the shuttle operation is to begin; the transport may be in Stop, Play, or Record mode at this point. Press the SHUTTLE button.

- ❑ **Recording During Shuttle Mode:** To enter Record mode at any time while the tape is playing in Shuttle mode, press the RECORD button **[11]** on the Auto Locator. The machine will continue recording for the duration of that "pass" but will return to Play mode after it rewinds to the beginning of the shuttle segment.

NOTE: Unlike Search **[14]** and Search Zero **[15]** modes, the machine cannot be "preset" to begin Recording by pressing RECORD **[11]** while the tape is rewinding in Shuttle mode. Shuttle/Record mode works only when the Auto Locator RECORD button is pressed. Pressing the RECORD button on the Remote Control Unit or MTR-90III ends the shuttle and immediately causes the machine to enter normal Record mode.

- ❑ **Exiting Shuttle Mode:** To end ("abort") a Shuttle, press STOP, RWD or F.FWD on the Auto Locator or the MTR-90III transport; or the PLAY button on the Remote Control Unit or on the transport.

[14] SEARCH Button

Pressing the SEARCH button causes the MTR-90III to fast wind (or rewind) the tape until the Auto Locator Tape Time matches that shown on the Locate Time readout **[3]**. There are three variations of Search mode:

- ❑ **Search/Stop:** Pressing SEARCH will move the tape to the Locate Time and then stop the transport.

- ❑ **Search/Play:** Pressing the SEARCH and PLAY **[11]** buttons causes the PLAY button to flash and the tape to wind to the Locate Time. The transport enters Play mode and the PLAY button will remain brightly illuminated.

- ❑ **Search/Record:** Pressing the SEARCH and then the PLAY and RECORD **[11]** buttons causes the PLAY and RECORD buttons to flash and the tape to wind to the Locate Time and enter Record mode.

NOTE: Search/Play (Search/Record) mode functions only when the PLAY button (or PLAY and RECORD buttons) on the Auto Locator is pressed. Pressing this button (these buttons) on the Remote Control Unit or on the transport ends the search and causes the machine to enter Play (Record) mode.

- ❑ **Ending Search:** To end ("abort") a Search press STOP, REWIND or FAST FORWARD on the Auto Locator; their counterparts on the MTR-90III transport; or the PLAY button on the Remote Control Unit or on the transport.

[15] SEARCH ZERO Button

Pressing the SEARCH ZERO button causes the MTR-90III to return at fast wind (or rewind) speed to the 0.00.00 Tape Time shown on the MTR-90III Tape Time readout. There are three variations of Search Zero Mode.

NOTE: If the Auto locator Tape Time readout has been changed to a different zero from the MTR-90III, it will reset to match the MTR-90III the moment SEARCH ZERO is pressed. Search Zero always searches for the zero of the MTR-90III Tape Time display.

- ❑ **Search Zero/Stop:** Pressing the SEARCH ZERO button will wind the tape to zero Tape Time and then stop the transport.
- ❑ **Search Zero/Play:** Pressing the SEARCH ZERO and PLAY **[11]** buttons causes the PLAY button to flash and the tape to wind to zero Tape Time. The transport enters Play mode and the PLAY button will remain brightly illuminated.
- ❑ **Search Zero/Record:** Pressing the SEARCH ZERO and then the PLAY and RECORD **[11]** buttons causes the PLAY and RECORD buttons to flash and the tape to wind to the zero point and enter Record mode.

NOTE: Search Zero/Play (Search Zero/Record) mode functions only when the PLAY button (or PLAY and RECORD buttons) on the Auto Locator is pressed. Pressing this button (these buttons) on the Remote Control Unit or on the transport ends the search and causes the machine to enter Play (Record) mode.

- ❑ **Ending Search Zero:** To end ("abort") a Search Zero, press STOP, REWIND or FAST FORWARD on the Auto Locator; their counterparts on the MTR-90III transport; or the PLAY button on the Remote Control Unit or on the transport.

[16] ZERO SET Button

This button is used to automatically reset both the MTR-90III and the Auto Locator Tape Time readouts to zero at a specific point on the tape (see **§4.3.10**.)

[17] SEARCH 0–9 Buttons/Indicators

When moving the tape directly to the memorized location, press the SEARCH 0–9 button of the memory in which the location has been memorized. The tape moves automatically to the position.

[18] STORE 0–9 Buttons/Indicators

When one of these buttons is pressed, the tape time displayed in the Locate Time readout will be stored into the memory of the button pressed. When the indicator for a STORE 0–9 button is illuminated, it indicates that a tape time is stored in its memory and that STORE 0–9 button is ineffective. Up to ten tape times can be stored.

- ❑ **Clearing Cue Memories:** Pressing the STORE 0–9 button for any memory twice within one second will clear that memory.

[19] ALL CLEAR Button

Pressing the ALL CLEAR button twice within one second will clear all Cue Memories.

Section 4 Operation

This section contains a list and an accompanying explanation of each of the operating conditions (or modes) of the MTR-90III and detailed instructions describing each mode of operation. All portions of this section should be read when first becoming familiar with the machine and then again as a guide while learning to operate the machine. The Table of Operating Modes provides a quick reference, and the detailed portion provides in depth instructions about how to operate the machine. Information regarding installation and set-up of the machine is contained in **Section 2** of this manual. If unpacking and hooking up the machine for the first time, please refer to **Section 2** before continuing with this section.

OTARI recommends situating the Remote Control Unit (and the optional Auto Locator) in a convenient location near the mixing console.

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4.1 Modes of Operation

CAUTION: The reel motor on the MTR-90III supplies a powerful torque force. When a tape is threaded on the machine, do not touch the reel or tension arm. When the machine is in Fast Wind mode, exercise caution to keep hair, clothing, jewelry, fingers, etc., away from the reel. When the operations are controlled from the Remote Control, precautionary measures are important. It is imperative that the swing arms are not pressed directly when a tape is threaded. To shuttle the tape back and forth slowly, do not attempt to move the reels by hand. Instead, place the transport in Stop mode and turn the top of the capstan by hand or press the MTR-90III CUE button and move the adjacent Cue Wheel.

In the following table, mode names in parenthesis indicate that the MTR-90III must be in the indicated mode before the designated button is pressed. For example, to enter Unload mode: (Stop) + UNLOAD means the MTR-90III must be in Stop mode before the UNLOAD button is pressed.

Table 4-1
Modes of Operation

MODE	CONTROL	OPERATION
Play	PLAY	Tape plays from Supply to Take-up at the selected speed.
Record	PLAY+RECORD or (Play)+RECORD	Any channel in Record Ready begins to record as tape moves from Supply to Take-up.
Stop	STOP	Tape motion stops.
Fast Forward	F.FWD	Tape moves from Supply reel to Take-up reel at fast wind speed.
Rewind	REWIND	Tape moves from Take-up reel to Supply reel at fast wind speed.
Load	(Unload)+STOP	Both reels turn to remove any slack in the tape and the tension servo system is activated.
Unload	(Stop)+UNLOAD	Tension servo system is deactivated.
Normal Cue Mode	(Stop)+CUE+Cue Wheel	Tape motion is proportional to the amount the Cue Wheel is turned.
Fast Cue Mode (Lifter Defeat)	(Fast Wind)+CUE	The tape lifters are retracted to allow audio monitoring.
Spot Erase	SPOT ERASE	The tape can be moved by hand for erasure of small areas of tape.

4.2 Record and Play Modes

If there are any unusual sounds, mechanical malfunctions or strange odors during the following procedures or if anything seems to be abnormal, immediately turn off the POWER switch, unplug the AC cord and inspect the machine to determine the cause. If in doubt as to the cause or severity of the problem after consulting the appropriate section of this manual, contact the nearest OTARI representative or the OTARI technical service department for assistance.

NOTE: If the MTR-90III is set up with a 16 channel (8-channel) head assembly, disregard all Remote Control Unit switches for channels 17-24 (9-24).

4.2.1 Threading the Tape on the Machine

1. Unlock the reel tables so they will accommodate a reel hub by lifting up the clamp levers on top.

2. Place a reel on the Reel Table and lower the clamp levers to secure the reel to the Reel Table.

NOTE: There is a locating pin near the bottom of each reel table. In order for the reel to seat firmly against the reel table, be sure one of the slots in the reel hub is aligned with the locating pin. To lock reel to reel table, push down on clamp level until it is seated. Failure to observe this precaution will cause the reel to "float" and may damage the reel and/or the tape.

3. Turn on the power (the POWER switch is behind the front door of the MTR-90III at the left side near the bottom). The adjacent 8 pilot lights (Light Emitting Diodes-LEDs) illuminate indicating the different sections of the power supply are operating. The meter lamps and the lamps in the transport buttons glow dimly except the TAPE UNLOAD button which should be brightly illuminated. The Tape Time counter on top of the head assembly should indicate "0.00.0" in red numerals. This indication appears several seconds after the power is turned on.

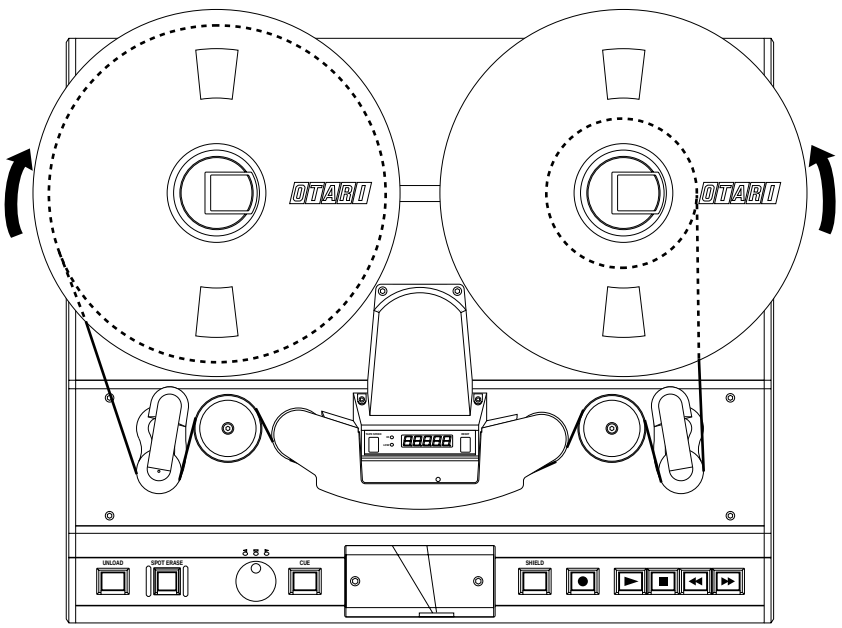

Figure 4-1
Tape Threading Path

4. Pull about 120 cm (4') of tape from the reel and thread along the tape path shown in **Figure 4-1** (also imprinted on the MTR-90III deck plate near the transport buttons). Wind the tape 2 or 3 time around the empty reel, make sure the tape does not slip and is wound firmly. Do not fold the end of the tape as the bump created will disrupt the constant servo tension and create unnecessary swing arm jitter (vibration).

5. Turn both reels in the direction shown by the arrows in **Figure 4-1** to tighten the tape. This will cause the swing arms to retract fully and "click" into place. Both green LEDs on the REEL CONTROL PCB Assembly (board #1 in the lower card cage) illuminate.

CAUTION! Hold the reels by the edge of the flange so if the reel motors should be actuated, the reel can be released without risk to fingers or hands.

6. Press the STOP button. The STOP will be more brightly illuminated than all the other tape motion push buttons, and both swing arms should move to approximately mid-position (centered). The reel servos are now activated, and the tape is under constant tension.

4.2.2 Recording Initial Tracks

1. Thread a blank tape on the transport (**§ 4.2.1**).

2. Select the desired Tape Speed, HI or LOW. Unless there is some special application, use the FIX SPEED MODE setting.

3. Reset the Tape Time Counter by pressing the RESET button on the MTR-90III.

4. Apply a test signal to those inputs to the MTR-90III corresponding to the tracks to be recorded.

5. On the Remote Control Unit press the ALL INPUT button.

6. On the Remote Control Unit disengage the ALL SAFE switch (adjacent indicator off) and move the READY/SAFE switches to the READY position for those channels to be recorded. The indicators for those channels will flash.

7. Adjust the mixing console buss levels so that the MTR-90III meters are peaking no higher than between -3 and 0 VU.

NOTE: Monitor the output of the MTR-90III (which is the same as the input) rather than the buss output of the mixing console.

8. It is good practice to record reference tones at the head of every session tape for level matching later. Use 700 (or 1 kHz), 100 Hz, and 10 kHz tones at 0 VU reference level. The tones should not be noise reduction encoded even if a noise reduction system is being used.

9. When ready to record, press the PLAY and RECORD buttons on the MTR-90III or the Remote Control Unit. The Ready/Safe indicators will stop flashing and remain illuminated indicating the selected tracks are recording.

10. To cease recording on all channels, press the STOP button to stop all tape motion, or the PLAY button to remove the channels from Record mode and continue in Play mode. To cease recording on only certain channels and continue recording on others, move the corresponding READY/SAFE levers to the Safe position.

4.2.3 Playback of Initial Tracks

1. Rewind the tape to the beginning of the recording by pressing SEARCH ZERO on the Auto Locator (if the Tape Timer was reset at the beginning of the recording session) or by pressing the REWIND button.
2. Set the ALL SAFE switch on the Remote Control Unit to the ALL SAFE position to avoid accidentally erasing recorded tracks. The ALL SAFE indicator will become illuminated.
3. Set the Output Selector switches for the recorded tracks to the REPRO position or press the ALL REPRO button. The REPRO indicator for the tracks being reproduced will become illuminated.
4. Press the PLAY button. The signal on the tape will be reproduced by the Reproduce head and fed to the Output connectors.
5. Adjust the monitor level at the mixing console.

4.2.4 Sel·Rep Recording (Overdubbing)

Overdubs are performed when it is necessary to add additional tracks synchronized with material already recorded on other tracks. During Sel·Rep (Selective Reproduction) playback the recorded material is reproduced by the record head making it possible to add (overdub) tracks without delay caused by the space between the Record and Reproduce heads (as in normal playback). When overdubs are recorded, the recorded tracks are played in Sel·Rep and monitored through the mixing console. The new material is then recorded in synchronization with the existing tracks.

A variation of this technique involves an insert, or punch-in, of new material to replace or add to a previously recorded track. This method is discussed in **§ 4.2.5 Sel·Rep Recording (Punch-Ins)**.

NOTE: For rehearsal of an overdub, see **§ 4.2.6**.

1. Press the ALL SEL·REP button on the Remote Control Unit.
2. Move the ALL SAFE switch to its OFF position (adjacent red indicator off).
3. For the channels to which new material is to be added, set the READY/SAFE switches to the READY position (red indicator above flashes). For the other channels (channels not to be recorded), set the READY/SAFE switches to the SAFE position (red indicator above off).

NOTE: When the tape is stopped, the input of any tracks set to Ready mode will be monitored unless SW1-2 on the TRANSPORT CONTROL PCB Assembly is off (see **§ 2.1** Step 2).

4. Press the PLAY and RECORD buttons to begin recording. The input signal from the channels being recorded and the signal from the tape from the record head and sync amp on those tracks not being recorded will be monitored.
5. To end the recording, press the STOP button. As a further precaution, engage the ALL SAFE switch to prevent accidental erasure of those channels set to Ready mode.

4.2.5 Sel·Rep Recording (Punch-Ins)

Punch-ins are performed when it is necessary to insert new material into a track that has already been recorded without recording the entire track again. Punch-ins allow monitoring of previously recorded material on the tracks selected for recording, right up to the instant the track is put into Record. At the moment that the track(s) enter Record mode, the MTR-90III switches the output of the tracks being recorded to Input monitor so that the new material can be monitored as it is being recorded in synchronization with the material recorded earlier.

NOTE: For rehearsal of Punch-ins see **§ 4.2.6**.

1. Rewind the tape to a point just before the beginning of the section to be recorded.

2. Move the ALL SAFE switch to its OFF position (adjacent red indicator off) and press the ALL SEL·REP button.

3. Set the READY/SAFE switches for all the tracks that are not going to be recorded to Safe. Set the READY/SAFE switches for the tracks that are going to be recorded to Ready.

NOTE: When the tape is stopped, the input of any tracks set to Ready mode will be monitored unless SW1-2 on the TRANSPORT CONTROL PCB Assembly is off (see **§ 2.1** Step 2).

4. Begin playback. Listen to the monitor and when the beginning of the punch-in section is played, press the RECORD button to begin recording. Best results are obtained by punching-in during a pause on the tracks being recorded (on the off-beat). The input signal from the channels being recorded and the signal from the tape from the record head and sync amp on those tracks not being recorded will be monitored.

NOTE: There is a short delay from the instant the RECORD button is pressed to the initiation of recording due to the gapless punch-in feature.

5. There are two ways to end the punch-in:

   - ❑ Press the PLAY button to end the insert but continue monitoring the tape for a second punch-in.

   - ❑ Press the STOP button to end the recording all punch-ins. Engage the ALL SAFE switch as a further precaution.

4.2.6 Rehearsal of Overdubs and Punch-Ins

For the overdub and punch-in procedures discussed in **§ 4.2.4** and **§ 4.2.5** there was no way to monitor the new input signal unless and until the machine was recording. It may be desirable to do "dry runs" (i.e., rehearse the overdub or punch-in) by playing previously recorded tracks through the record head and sync amps and by monitoring the input of the tracks to be recorded.

4.2.6.1 Rehearsal of Overdubs

1. Press the INDIVIDUAL button on the Remote Control Unit so the individual Output Selector switches can be operated.
2. Set the channels to be recorded to Input mode (set switch to INPUT position) and set the other channels to Sel·Rep mode (set switch to SEL·REP position).
3. Engage the ALL SAFE switch (adjacent red indicator on). The position of individual READY/SAFE switches is not significant for this step (although presetting the switches according to the intended overdub or punch-in may be useful).
4. Press the PLAY button. The input signal for all rehearsal tracks and the signal from the record head and sync amp for all other tracks will be monitored.
5. To end the overdub rehearsal, press the STOP button.

4.2.6.2 Rehearsal of Punch-Ins

1. Press the INDIVIDUAL button on the Remote Control Unit so the individual Output Selector switches can be operated.
2. Set the channels to be recorded to Input mode (set switch to INPUT position) and set the other channels to Sel·Rep mode (set switch to SEL·REP position).
3. Engage the ALL SAFE switch (adjacent red indicator on). The position of individual READY/SAFE switches is not significant for this step (although presetting the switches according to the intended overdub or punch-in may be useful).
4. Set all channels to Sel·Rep mode by pressing the ALL SEL·REP button. All tracks will be reproduced from the record head and sync amps. At the instant the punch-in is to be initiated, press the INDIVIDUAL button to switch the rehearsal tracks to Input mode.
5. There are two ways to end the punch-in rehearsal.
   - ❑ If the insert is to be ended but the tape monitoring to be continued for a second punch-in rehearsal, press the ALL SEL·REP button.
   - ❑ If all punch-in rehearsals are finished, press the STOP button.

4.2.7 Mixdown

The procedure for mixdown is the same as for playback of the initial tracks (**§ 4.2.3**). Be sure to use the reproduce head (Repro mode) rather than the record head (Sel·Rep mode) for best quality.

4.2.8 Cue Modes

4.2.8.1 Normal Cue Mode

When the machine is in Stop mode, pressing the CUE button on the MTR-90III (not on the Remote Control Unit) activates the adjacent Cue Wheel. The wheel can then be rotated clockwise or counterclockwise to shuttle the tape between the Supply and Take-up reels for locating cue points, matching edit points and so forth. The actual tape speed is proportional to the degree of rotation.

1. Press the CUE button.
2. Turning the Cue Wheel clockwise move the tape in the forward direction. Turning the Cue Wheel counterclockwise move the tape in the reverse direction. The triangular indicators near the Cue Wheel indicate the direction of the tape movement (forward or reverse). Turning the Cue Wheel further increases the tape speed.
3. Return the Cue Wheel to its original position to stop the tape movement. In order to exit Cue mode, press the STOP, PLAY, F. FWD or RWD button.

NOTE: If the head shields are up and the tape needs to be seen as it passes over the heads, press the SHIELD button on the MTR-90III Transport.

NOTE: The above mode can be used for very fast or slow playback of a tape beyond the ±20% allowed by the Pitch Control described in **§ 4.2.10**.

4.2.8.2 Fast Cue Mode (Lifter Defeat)

This mode permits auditioning of the tape during FAST FORWARD or REWIND modes by retracting the tape lifters and padding all the audio tracks by approximately 20 dB.

1. While the machine is in Fast Forward or Rewind mode, press the CUE button on either the MTR-90III or the Remote Control Unit to retract the tape lifters.
2. The lifters will remain retracted for as long as the button is held pressed. Release the button to extend the lifters again.

CAUTION: Be sure the monitor amps are turned off or the volume is down. Otherwise programs recorded on the tape are reproduced as a high pitch squeal which could cause damage to loudspeakers. The volume level of the monitor speaker can be attenuated by setting SW4 on the BIAS CONTROL PCB Assembly (#7). For details, please refer to **Table 2-4** in **§ 2.1**.

4.2.9 Spot Erasure

The Spot Erase function is available for erasing short lengths of unwanted tracks.

1. Search for the portion of tape to be erased in Cue mode or by rotating the top of the capstan motor by hand.
2. Mark the beginning and the end of the portion of the tape to be erased with a grease pen.
3. Press the STOP button.
4. Set the READY/SAFE switch to the READY position for the channel to be erased. Set all other channels to SAFE.
5. Press the SPOT ERASE button. (The SPOT ERASE and STOP lamps will blink.)
6. Move the tape slowly by rotating the top of the capstan motor by hand.
7. Press the CUE button just before the beginning of the portion to be erased reaches the erase head. (Keep pressing both the SPOT ERASE and CUE buttons. Both lamps will illuminate.)
8. Keep the tape moving until the end of the portion to be erased comes in front of the erase head, then release the buttons. (Continue moving the tape slowly for an instant.)
9. The erase current slowly diminishes thus leaving no noise on the tape.

4.2.10 Variable Speed Mode

By setting the Speed Mode Selector on the CB-147 Remote Control to VARI, the Record/Playback tape speed can be adjusted from the selected speed over a range of approximately ±20% (approx. ±2 tones). The actual tape speed can be calculated by multiplying the selected tape speed by the percentage of variation indicated on the PITCH CONTROL digital readout and adding or subtracting that value from the base speed; or it can be read directly from the Speed Display screen when the SPEED DISPLAY switch is set to the IPS position (press the SPEED DISPLAY button to turn on the Speed Display screen). Variable speed can used to "tune up" new or old tracks during overdubs, to change tempos, to bring a song into vocalist's range, to squeeze or stretch a program to fit a particular time slot, etc.

1. Set the Speed Mode Selector switch on the Remote Control unit to the VARI position.
2. Use the PITCH CONTROL on the Remote Control unit to vary the capstan speed as desired. Turning the PITCH CONTROL counter-clockwise causes the speed to decrease, turning it clockwise causes the speed to increase.
3. To exit Vari mode, set the Speed Mode Selector switch to the FIX position.

4.2.11 External Speed Reference

An external clock (reference oscillator) can be used to control the speed of the MTR-90III capstan motor. When the SPEED MODE switch is set to EXT position, a suitable input signal must be applied to P/N18 of the EXT CLOCK input connector (a 25 pin Honda connector on the MTR-90III rear panel) or P/N20 of the Parallel I/O Connector (37 pin connector on the MTR-90III rear panel). The reference frequency is 9,600 Hz, and should be at TTL level (0 V low, +5 V high), approximately a 50% duty cycle; a sine wave source may be used at a level of about 10 Vp-p. Do not feed 9.6 kHz signals to the EXT CLOCK and PARALLEL I/O connectors at the same time.

When the external reference is in use, the HIGH/LOW SPEED SELECT switch still operates although tape speeds (15/30 ips or 7.5/15 ips) vary proportional to the deviations of the clock input from the reference frequency.

When using SMPTE time code synchronizers, the SMPTE-CUE slide switch (on the back of the upper card cage mother board near the #24 card connector) should be turned on to activate Lifter Defeat. If the MTR-90III is being used for 16 track operation, a jumper cable will have to be installed to join the 3-pin Molex connector adjacent to this switch to a similar connector on the same circuit board located between the #16 and #17 card connectors (#8 and #9 for 8 track operation).

Detailed information on using time code synchronizers with the MTR-90III is available from the manufacturer of the equipment or by contacting OTARI.

4.3 Auto Locator Operation

The OTARI CB-148 Auto Locator is designed specifically for the MTR-90III. It uses a microcomputer for sophisticated, precision control of tape motion without overshoot. The tape time memory stores up to 10 cue points (11 if search zero is also considered) which can be directly memorized by pressing only one button instead of being keyed in and can be directly recalled instantly by pressing another button. And there is an independent digital built in stop-watch. Each memory and readout can accommodate times of up to 9H59M59S. In addition to special Auto Locator functions such as Search, Search Zero, Zero Set, Shuttle and Auto Rewind (described in subsequent paragraphs), there is a duplicate set of tape transport control buttons like those on the Remote Control Unit and transport. The CB-148 Auto Locator should be installed as detailed in **§ 2.3** and **§ 2.4**. The front panel features of the Auto Locator are briefly described in **§ 3.3**.

4.3.1 Entering Locate Times

The Locate Time readout displays the tape time to be located when the SEARCH, SHUTTLE or AUTO REWIND buttons are pressed. There are 3 ways to enter Locate times:

- ❑ Locate times can be entered directly from the 10-Key pad. Negative locate times can be entered with the +/- button.
- ❑ Locate times can be recalled from stored tape locations or cues (see **§ 4.3.3**).
- ❑ Locate time can be "copied" from the Tape Time readout by pressing the SHIFT RIGHT button.

NOTE: It is impossible to enter a locate time with a numeral of 6 or higher in the tens digit for minutes or seconds.

4.3.2 Storing Cue Points

There are two ways to store cue points into the Auto Locator memory. Both methods store the tape time displayed on the Locate Time readout and not the time on the Tape Time readout.

- ❑ **Storing with the STORE 0-9 Buttons (Direct Store):** The tape time can be directly stored in memory without using the 10-Key Pad. Up to ten memories can be stored just by pressing a button with an dark indicator.

1. To store a given cue, display the desired cue point time in the Locate Time readout (refer to **§ 4.3.1**).
2. Press a STORE 0-9 button with an dark indicator. The number pressed (0 through 9) becomes the "address" where the Locate Time is stored. If an indicator is illuminated, a tape location has already been stored in that memory and that STORE 0-9 button is inoperable.
3. To store a second cue, repeat Steps 1 and 2 using a different address. The same address or the address of a memory with a tape location stored cannot be used.

NOTE: To use this method when an address already has a tape time stored, the memory must first be erased before proceeding.

- ❑ **Storing with the STO Button and the 10-Key Pad:** The STO button is used to memorize the time displayed in the Locate Time readout. Up to ten different times can be stored at once. Memory is volatile, meaning it is not saved after the power is turned off.

1. To store a given cue, display the desired cue point time in the Locate Time readout (refer to **§ 4.3.1**).
2. While holding the the STO button down, press any one of the 10 numeric keys on the 10-Key Pad. The number pressed (0 through 9) becomes the "address" where the Locate Time is stored.
3. To store a second cue, repeat Steps 1 and 2 using a different address. If the same address is re-used, the previously stored time will be replaced by the new entry.

NOTE: Tape Time can be "captured" "on the fly" while the tape is playing or recording by pressing SHIFT RIGHT at the exact time to be recorded and then pressing STO followed by a numeric address or by pressing a STORE 0-9 button.

4.3.3 Recalling Cue Points

The RCL button is used to retrieve a time which was previously stored and display it in the Locate Time readout. When the machine is first turned on, all addresses are initialized so they contain 00.00.

1. To recall a given cue, press the RCL button and then press the numeric key (0 through 9) which identifies the "address" where the time was stored. The time will display on the Locate Time readout and will also remain in memory.
2. To recall another cue, Repeat Step 1. It is not necessary to first reset the readout since the recalled time will replace any previously displayed Locate Time.

4.3.4 Clearing Cue Points

There are several methods to clear the memories.

- ❑ Enter 0H00M00S into the Locate Time and pressing the STO button and the number of the address of the memory to be erased on the 10-Key pad. The tape time location of 0H00M00S will be stored.
- ❑ Press the STORE button for the memory to be erased twice within one second.
- ❑ Pressing the ALL CLEAR button twice within one second will clear all memories.

4.3.5 Search

There are two ways to search for cue points. When Search mode is initiated, the tape fast winds to the location displayed on the Locate Time readout or to the tape time stored in the Auto Locator memory. When using the SEARCH button and the 10-Key Pad, it is possible to initiate Search/Play or Search/Record.

- **Searching with the SEARCH 0-9 Buttons (Direct Search):** Pressing a SEARCH 0-9 button moves the tape directly to the location stored in that cue point and stops.

- **Searching with the SEARCH Button and the 10-Key Pad:** Pressing the SEARCH button causes the MTR-90III to fast wind the tape until the Auto Locator Tape Time matches that shown on the Locate Time readout. There are three variations of Search mode:

  1. Pressing SEARCH will move the tape to the Locate Time and then stop the transport. While in Search mode, the SEARCH and F.FWD (or RWD) buttons will illuminate brightly. When the tape stops, the STOP button will illuminate and the other buttons will become dim.

  2. Pressing SEARCH and then PLAY causes the PLAY button to flash, the tape will fast wind to the Locate Time,t he STOP button brightens for an instant, the PLAY button stops flashing and stays brightly illuminated, the transport enters Play mode, and then the SEARCH button returns to its dim state.

  3. Pressing SEARCH and then PLAY and RECORD causes the PLAY and RECORD buttons to flash bright and dim, the tape will fast wind to the Locate Time, the STOP button will brighten for an instant and the tape momentarily stops, the PLAY and RECORD buttons will stop flashing and stay brightly illuminated, the transport will enter Record mode, and then the SEARCH button will return to its dim state.

NOTE: The Search Play (Search Record) mode functions only when the PLAY (or PLAY and RECORD) button on the Auto Locator is pressed. Pressing these buttons on the Remote Control Unit or on the transport ends the search and causes the machine to enter Play mode.

- To end ("abort") a Search press STOP, RWD or F.FWD on the Auto Locator; their counterparts on the MTR-90III transport; or the PLAY button on the Remote Control Unit or on the transport.

4.3.6 Search Zero

Pressing the SEARCH ZERO button causes the MTR-90III to return at fast wind speed to the 0.00.00 Tape Time shown on the MTR-90III Tape Time readout. There are three variations of Search Zero Mode.

NOTE: If the Auto locator Tape Time readout has been changed to a different zero from the MTR-90III, it will reset to match the MTR-90III the moment SEARCH ZERO is pressed. Search Zero always looks for the zero time on the MTR-90III Tape Time display.

1. Pressing SEARCH ZERO will wind the tape to zero Tape Time and then stop the transport.

2. Pressing SEARCH ZERO and PLAY causes the PLAY button to flash bright and dim, the tape will wind to zero Tape Time, and the transport will enter Play mode at which time the PLAY button will remain brightly illuminated.

3. Pressing SEARCH ZERO and then PLAY and RECORD causes the PLAY and RECORD buttons to flash bright and dim, the tape will wind to the zero point and enter Record mode.

NOTE: The Search Zero/Play (Search Zero/Record) mode functions only when the PLAY (or PLAY and RECORD) button on the Auto Locator is pressed. Pressing these buttons on the Remote Control Unit or on the transport ends the search and causes the machine to enter Play mode.

- ❑ To end ("abort") a Search Zero, press STOP, REWIND or FAST FORWARD on the Auto Locator; their counterparts on the MTR-90III transport; or the PLAY button on the Remote Control Unit or on the transport.

4.3.7 Shuttle

The Shuttle mode allows for continuous playback of a section of tape. Shuttle mode is helpful for playing a section of an alignment tape, for rehearsing a particular segment of a tune, and so forth.

NOTE: If the Locate Time is not greater than the displayed Tape Time, the SHUTTLE will enter Reverse Shuttle mode. The tape will stop when the button is pressed and rewind to the time displayed in the Locate Time display and then enter into Play mode. This cycle will repeat until cancelled.

1. Enter the Locate Time where the shuttle is to stop and rewind the tape.
2. Move the tape to the point where the shuttle operation is to begin; the transport may be in Stop, Play, or Record mode at this point.
3. Press the SHUTTLE button; the tape will begin to play and the SHUTTLE and PLAY buttons will brighten. When the Locate Time is reached, the PLAY button will dim, RWD will brighten, and the tape will rewind to the same Tape Time as when the SHUTTLE button was pressed. The PLAY button will then brighten (SHUTTLE is still bright), and the tape will play ahead to the Locate Time. This cycle continues until the Shuttle mode is ended.
4. To enter Record mode at any time while the tape is playing in Shuttle mode, press the RECORD button on the Auto Locator. The machine will continue recording for the duration of that "pass" but will return to Play mode after it rewinds to the beginning of the shuttle segment.

NOTE: Unlike Search and Search Zero modes, the machine cannot be "preset" to begin Recording by pressing RECORD while the tape is rewinding in Shuttle mode.

NOTE: Shuttle/Record mode works only when the Auto Locator RECORD button is pressed. Pressing the RECORD button on the Remote Control Unit or MTR-90III ends the shuttle and immediately causes the machine to enter normal Record mode.

- ❑ To end ("abort") a Shuttle, press STOP, REWIND or FAST FORWARD on the Auto Locator; their counterparts on the MTR-90III transport; or the PLAY button on the Remote Control Unit or on the transport.

4.3.8 Auto Rewind

AUTO REWIND is similar to Shuttle, except the tape will play to the Locate Time, rewind and stop at the point you first pressed AUTO REWIND rather than continue the play/rewind cycle.

1. Enter the tape time that will be the point the tape enters Rewind mode in the Locate Time readout (**§ 4.3.1**).
2. Press the PLAY button.
3. When the Tape Time reaches the point to be returned to, press the AUTO REWIND button which will brighten.
4. The tape will continue playing until it reaches the locate time. It will then rewind to the same Tape Time as when the AUTO REWIND button was pressed and stop. The STOP button will light up and the others will dim.

4.3.9 Setting the Tape Time Readout (Offset Mode)

The Tape Time readout displays the elapsed time of the tape relative to the same zero point shown on the MTR-90III readout or any other point on the tape such as the beginning of a take. The Tape Time readout setting can be changed in various ways: to match the Tape Time Counter Display, to match the Locate Time readout, or to read zero.

NOTE: When the power is first turned on, the displays of both units are set at zero.

- ❑ The LOAD button changes the Tape Time readout to display the same tape time shown on the MTR-90III Tape Time Counter Display. In other words, it resets the Auto Locator Tape Time to correspond to the actual time shown on the transport.
- ❑ To reset the Tape Time readout to zero, press the adjacent RESET button.
- ❑ To offset the Auto Locator Tape Time readout from the MTR-90III readout, select a Locate Time and press the Shift Left button.

4.3.10 Zero Set

To reset the Tape Time readout and the MTR-90III Tape Time Counter Display to zero, use the ZERO SET button.

1. Record one or two seconds of 1 kHz tone at 0 VU on track 1 at the point to be designated as zero time (Fixed speed).
2. Make sure that track 1 is set to Repro mode on the Remote Control Unit.
3. Press the ZERO SET button. The transport will enter Play mode (or will continue if already in Play mode). When the Auto Locator detects the 1 kHz tone on track one, the transport will stop and the Tape Time readouts on both the transport and the Auto Locator will be set to zero.

4.3.11 Stop Watch

The Stop Watch is independent and has no interaction with other Auto Locator functions or MTR-90III functions. Its readout displays up to 99 minutes 59 seconds. All of the buttons referred to in this section are found on the STOP WATCH Panel.

1. To start the watch from Stop mode, press START/LAP.
2. To take a "lap" time, press START/LAP again freezing that interim time on the readout while the watch still counts internally. To return to the elapsed time count press START/LAP once more.
3. To stop the counting and display the final time, press STOP. If STOP is pressed while a lap time is displayed, the readout will change and display the final time.
4. To zero the watch, press RESET. If pressed while the watch is counting, this also stops the count.

Section 5 Maintenance

The OTARI MTR-90III requires very little maintenance other than routine electronic alignment to different tape batches, cleaning, and demagnetization. In addition to these day-to-day maintenance procedures, there are a few items that will benefit from occasional cleaning and/or lubrication. Such items, plus a few parts replacement procedures, are covered in this section of the manual.

When first performing these procedures, proceed slowly and carefully. Soon the procedures will be familiar, but it is better to be cautious and avoid accidents.

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CAUTION! Do not close the Transport while the VU Meter Panel is closed. When performing these maintenance procedures, it may be necessary to open the Transport. When closing the Transport, make sure the VU Meter Panel is open. Closing the Transport while the VU Meter Panel is closed will cause damage to the shield motor.

5.1 Demagnetizing and Cleaning the Tape Path

The following items are necessary to perform the maintenance procedures outlined in this section.

- ❑ A head demagnetizer (degausser).
- ❑ Pure isopropyl alcohol for head cleaning.
- ❑ Lint-free cloth and cotton swabs.

CAUTION: Do not use rubbing alcohol as it can leave water and oil residues. **Do not use other solvents** as they may delaminate the heads.

5.1.1 Demagnetizing the Heads and Tape Guidance Path

Demagnetizing (sometimes called degaussing, although that term more often refers to bulk tape erasure) is a necessary procedure and should be performed prior to every alignment and recording session. It should always be done with extreme care.

DEMAGNETIZING CAUTION: To avoid damaging the MTR-90III, always make sure the POWER switch is off before proceeding. The AC field created by the demagnetizer is extremely powerful and could seriously damage electronics if they are powered up. Also, remove all recording tape, especially alignment tapes, from the vicinity of the MTR-90III when performing these procedures.

DEMAGNETIZING CAUTION: Never turn on or turn off the power to the demagnetizer unless it is at least 1 meter (3 feet) away from the MTR-90III. The demagnetizer creates an especially strong moving magnetic field which could possibly place a permanent magnetic charge on parts of the tape machine. The demagnetizer would not be powerful enough to remove such charges under normal operating conditions, and the parts might therefore have to be discarded. **Use only a professional demagnetizer of high flux density; inexpensive "HI-FI" type demagnetizers can leave residual fields that will cause more harm than benefit.**

1. Turn off the power.
2. With the demagnetizer at least 1 meter (3 feet) away from the MTR-90III, plug the demagnetizer into the power mains and turn it on.
3. Slowly move the demagnetizer toward the Supply swing arm roller (on the left side of the transport) until the tip is about 3 mm (1/8") away.
4. Slowly move the demagnetizer tip up and down along the roller, while simultaneously turning the roller with the other hand so that the entire roller surface is directly exposed to the demagnetizing field.

WARNING! Do not touch any MTR-90III parts with the demagnetizer.

5. Slowly move the demagnetizer at least 1 meter (3 feet) away from the MTR-90III.

6. Working from left to right, repeat steps 3,4, and 5 for each additional metallic part in the tape path:

   A. Tachometer idler
   B. Guide roller (Supply)
   C. Tape lifter (left)
   D. Erase head
   E. Record head
   F. Scrape flutter filter roller
   G. Tape lifter (right)
   H. Reproduce head
   I. Guide roller (Take-up)
   J. Capstan idler
   K. Take-up swing arm roller

7. When all the above parts have been demagnetized, draw the demagnetizer at least 1 meter (3 feet) away, turn it off and/or unplug it.

5.1.2 Cleaning the Tape Path

It is important to regularly clean the route along which the tape travels. Oxide and dirt will shed from the tape and accumulate on the following parts causing a build-up that can create slippage, degrade frequency response and accelerate tape wear.

CAUTION: Never use any metallic item or abrasive to clean the heads or other tape guidance items. Never use MEK, spirits, lacquer thinner, acetone, or other solvents on the tape heads. Rubbing alcohol should be avoided since it contains oil that will leave a residue.

1. Moisten a cotton swab with pure (97–99%) isopropyl alcohol and wipe the entire surface of the Supply swing arm roller. Also clean the upper and lower flanges of the swing arm to keep oxide out of the roller reliefs (upper and lower cuts in the roller). Allow the roller to dry by evaporation.

2. Moisten additional swabs and clean the following parts:

   A. Guide roller (Supply)
   B. Tape lifter (left)
   C. Erase head
   D. Record head
   E. Scrape flutter filter roller
   F. Tape lifter (right)
   G. Reproduce head
   H. Guide roller (Take-up)
   I. Take-up swing arm roller

CAUTION: Do not use isopropyl alcohol for the tachometer and capstan rollers. Instead used Otari “Deck Solvent” or equivalent that has similar high volatility.

This should be done as often as humanly possible, i.e., between sessions or approximately every 2–4 reels of tape.

5.1.3 Cleaning the Head Shield Screw

Perform this procedure once every 6 months or if the shields should become noisy or move erratically.

1. Turn the power off and open the VU Meter Panel.
2. Using a lint-free cloth, wipe off the screw (worm) shaft in the center of the head shield mechanism and the two smaller guide shafts on either side of that screw (**Figure 5-1**). To again access all areas of these parts, turn the power on, place the transport in Stop mode and press the SHIELD button. Turn the power off again.
3. Apply a light coating of utility oil onto the two shafts and the screw.

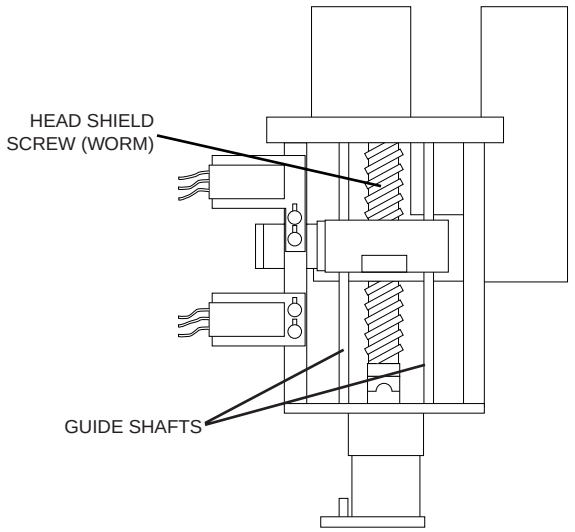

Figure 5-1
Head Shield Screw and Guide Rails

5.2 Routine Maintenance

This section covers routine maintenance procedures and a few parts replacement procedures. See **Section 6** for procedures on Alignments.

5.2.1 Removing and Reinserting the Printed Circuit Boards

The PCB Assemblies in the upper and lower card cages are equipped with convenient levers that uniformly distribute pressure when withdrawing the cards. Be sure to use the levers rather than pulling on the front lip of the PCB Assembly shield plate. Grasp both levers by the ends closest to the middle of the card and pull forward.

CAUTION: Before replacing PCB Assemblies, turn off the power first.

When replacing a PCB Assembly, observe that the PCB Assembly itself protrudes beyond the metal shield plate. It is the PCB Assembly, not the metal plate, that must be aligned with the upper and lower guides in the card cage. Slide the PCB Assembly in carefully, and then press firmly on both levers to seat the PCB Assembly fully home into its mating connector.

It makes no difference whether any of the PCB Assemblies in the upper cage (AUDIO PCB Assemblies, cards #1-24) are exchanged with one another; they are numbered for convenience so that once aligned to a given head assembly several PCB Assemblies can be removed and reinstalled to the same position, eliminating the need to realign the machine.

5.2.2 Hour Meter

The Hour Meter PCB Assembly is located under the transport between the reel motors. To gain access to the Hour Meter, lower the VU Meter Panel and open the Transport. The total amount of time the MTR-90III is in Load, Play and Record, and Fast Wind (F.FWD and RWD) modes is indicated on the Hour Meter PCB Assembly.

LOAD	Load mode
PLAY,REC	Play and Record modes
FAST	Fast Wind modes (Fast Forward and Rewind)

CAUTION! Do not close the Transport while the VU Meter Panel is closed. Closing the Transport while the VU Meter Panel is closed will cause damage to the shield motor.

5.2.3 Reel Motor Replacement

1. Turn the power off and unplug the AC power cable.

2. Remove the guard ring around the reel turntable of the motor to be replaced and then loosen the two recessed allen screws in the turntable hub and lift it off the motor shaft. Refer to **Figure 5-2**.

3. Remove the four phillips screws that secure the upper back panel of the chassis and fold the chassis down carefully.

4. Unplug the 4-pin UNIVERSAL MATE-N-LOK™ connector on the brake bracket attached to the reel motor and Reel Tachometer Connector. Refer to **Figure 5-2**.

5. Loosen the four cap head allen screws around the motor shaft on the top of the deck plate. Refer to **Figure 5-2**.

6. Remove the four motor mount screws and withdraw the motor. Be sure to support the motor from beneath so it does not fall into the chassis. Refer to **Figure 5-2**.

7. Install the replacement motor and secure with the four motor mount screws removed in Step 6.

8. Tighten the four cap head allen screws around the motor shaft on the top of the deck plate.

9. Plug in the 4-pin UNIVERSAL MATE-N-LOK™ connector from Step 4.

10. Close the chassis and secure the upper back panel of the chassis with the four phillips screws removed in Step 3.

11. Place the turntable hub on the motor shaft; tighten the two recessed allen screws. Place the guard ring around the motor reel turntable.

12. Check and adjust the following:

Reel Turntable Height	**§ 6.1.8**
Reel Tension Servo	**§ 6.1.9**.
Brake Tension	**§ 6.1.7**.

CAUTION! Improper installation can result in costly damage to the turntable and/or reel motor.

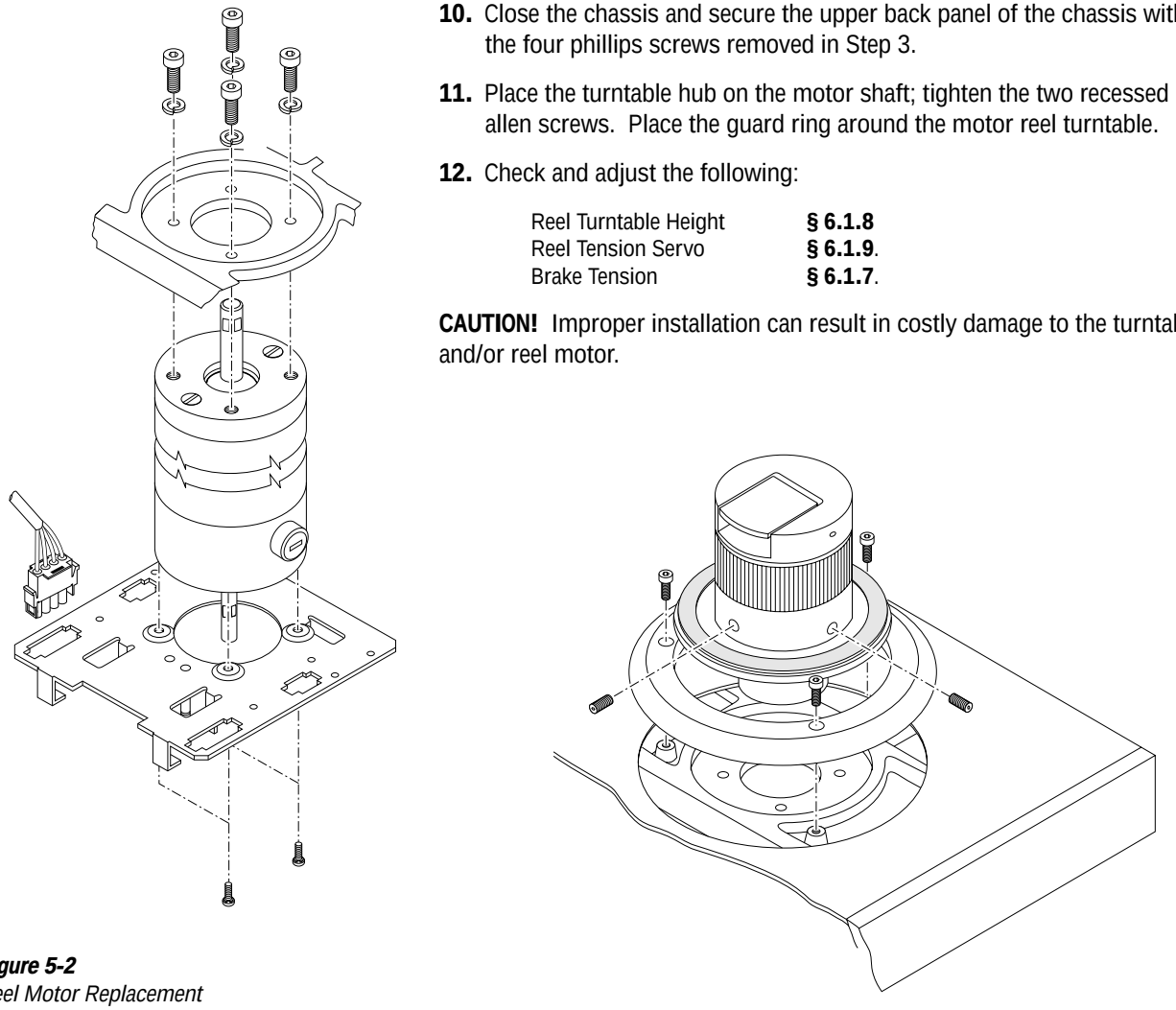

Figure 5-2
Reel Motor Replacement

5.2.4 Brake Band Replacement

Brake bands receive very little wear and seldom require replacement. If a band does wear out, perform the following procedure.

1. Turn off the power. Open the VU Meter Panel. Open the Transport.

2. Remove the Tachometer and its cover from the Brake Assembly.

3. Remove the four screws behind the brake arms that secure the brake band marked in **Figure 5-3** with black arrows.. Remove the brake pad.

4. Confirm that the new brake band is uniformly distant from the brake drum by moving the plunger of the brake solenoid by hand. Make adjustments by loosening the screws indicated in **Figure 5-3**.

5. Check and adjust the brake tension as described in **§ 6.1.7**.

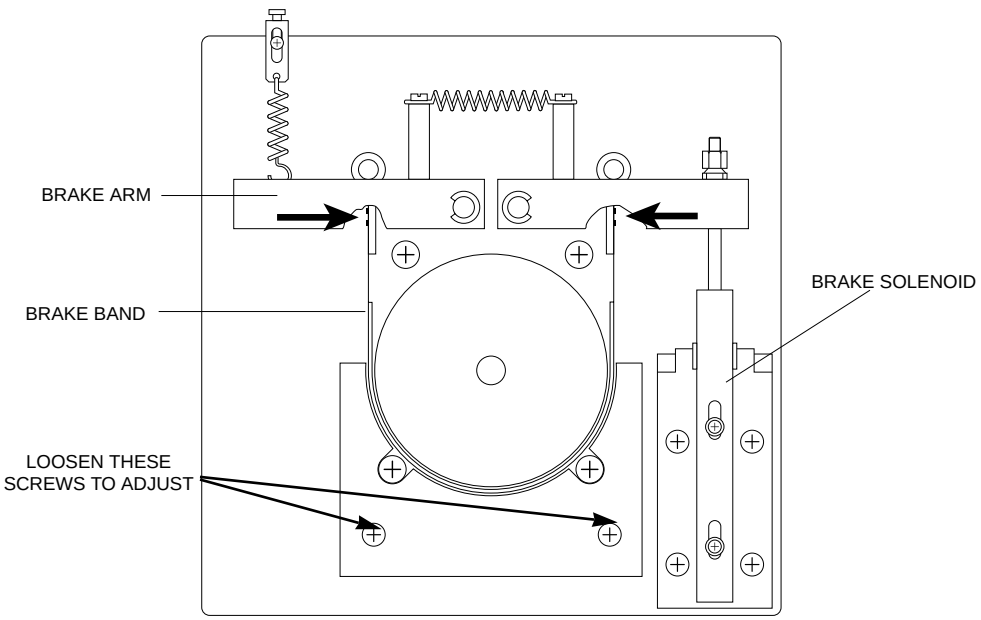

Figure 5-3
Brake Pad Replacement

5.2.5 VU Meter Lamp Replacement

The VU meter lamps are operated at less than their rated voltage and should have a very long life. If a lamp does burn out, replacement lamps are available from OTARI (Otari Part No. LU2070).

1. Turn off the power. Open the VU Meter Panel.
2. Locate the meter that needs a replacement lamp. Loosen the screw indicated in **Figure 5-4**. Turn or remove the metal plate.
3. Remove the old meter lamp with tweezers. Insert a new meter lamp.
4. Reinstall the metal plate and secure with the screw removed in Step 2.

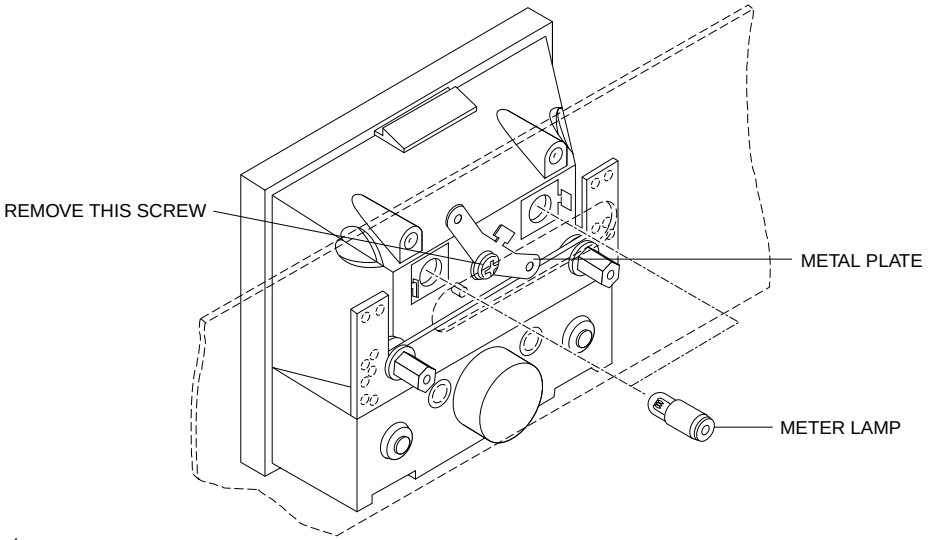

Figure 5-4
VU Meter Lamp Replacement

5.2.6 Head Shield Position Adjustment

Refer to **Figure 5-5**. The upper and lower sensor assembly positions can be adjusted slightly after loosening the respective phillips head screws.

The lower sensor should be adjusted so that the top of the shield plate lowers to approximately 1 mm above the head assembly base cover. The upper sensor should be adjusted so the shield plate raises to approximately 3 mm from the bottom lip of the head assembly cover plate.

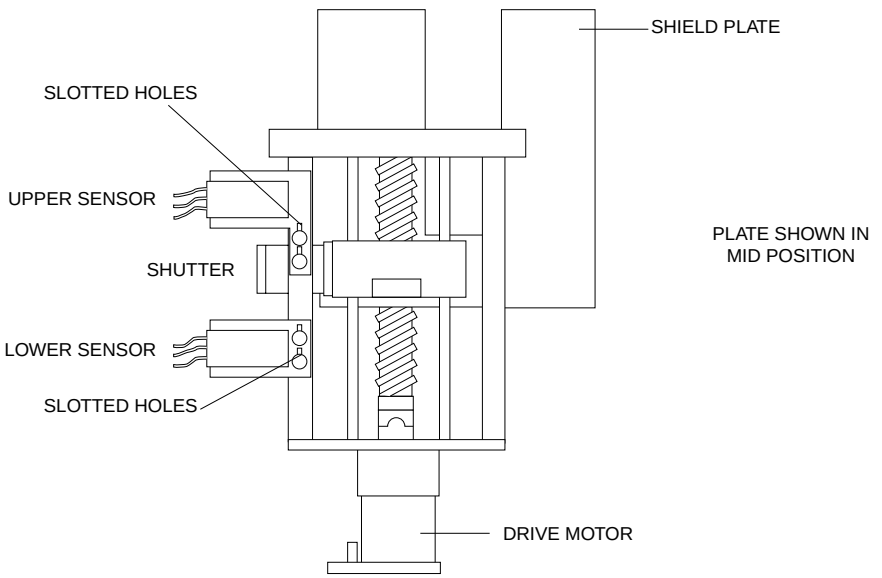

Figure 5-5
Head Shield Position Adjustment

5.3 Circuit Descriptions

Pertinent schematic diagrams in the drawing package accompanying this manual are referred to after each subtitle alternate drawing numbers are also given in parenthesis( ). Each circuit board has its own individual power supply regulation to provide the necessary voltages.

5.3.1 Playback Head and Preamp

PB-16KOA (PB9A577)

The playback (repro) head has a high impedance output (2 kΩ at 1 kHz). Its output is fed via a low capacitance audio cable into each channel's electronic module. The signal is AC coupled to a set of matched transistors Q101. These provide the initial gain stage. The output of this stage is fed to an operational amplifier which provides a low impedance output to drive the EQ and other stages (IC101).

5.3.2 Speed Selection and High Frequency Playback Equalization

PB-16KOA (PB9A577)

Equalization for 15 ips is switched on when FET Q104 is gated on by the logic circuitry. Similarly, 30 ips EQ is switched on when FET Q105 is gated on by the logic. Additionally, one has a choice between two different equalization curves at each speed. Two miniature switches on the Bias Control master circuit board allows the pre-selection of either a 35 µs time constant (IEC curve) or 50 µs (NAB curve) at 15 ips. The shorter time constant is toggled between 17.5 and 35 µs by FET Q102, and the longer is toggled between 30 µs and 50 µs by FET Q103.

5.3.3 Low Frequency Playback Equalization

PB-16KOA (PB9A577)

A standard low-frequency compensation is normally fixed at both 15 and 30 ips. Optionally, one may individually adjust the low frequency response of each channel (using trimmers on each channel's electronics) by moving the "LF COMP" switch on the Bias Control master board front panel from OFF to ON position. (OFF position selects the fixed compensation.) When the LF COMP switch is ON, FET Q107 is turned OFF, enabling trimmer VR104 to adjust the amount of the channel's low frequency equalization (the knee of the curve remains at 50 Hz).

5.3.4 Sync Playback

PB-16KOA (PB9A577)

Sync playback utilizes a circuit that is separate from, but identical to, normal playback electronics. The circuitry operates in nearly the same manner, with logic controlled selection of high frequency equalization, and the choice of fixed or variable low frequency EQ.

Transformer T101 steps up the head's output signal and feeds the signal to a set of matched transistors Q109 for preamplification. Second stage is provided by half of IC102, and a low impedance output is given by the other half of IC102.

15 ips Eq is switched ON by Q112, and 30 ips Eq is switched ON by Q113. the 15 ips time constant is selected by Q111, Q114 and 30 ips time constant is selected by Q110 and Q114. VR108 provides the adjustable low frequency EQ which is switched ON by Q115.

5.3.5 Output Stage

PB-16KOA (PB9A577)

Three FETs select the signal source to the output amplifier: the repro head (Q120), sync repro (Q122), or the input to the record electronics (Q118). The logic-selected signal is fed to the first stage of a dual Op Amp (Operational Amplifier) (IC103A) and then to a bias trap, the second half of the Op Amp (IC102B) and another bias trap. The output of the second bias trap is fed to an Op Amp (IC104). Here the signal is divided into two, the one being sent to IC104A and the other to IC105B, i.e., ACTIVE BALANCE OUTPUT circuit. SW101 is a switch selecting between BAL and UNBAL. Output to the VU meter is fed to the VU meter assembly through Q124 behind the second bias trap.

5.3.6 Input Circuitry

PB-16KOA (PB9A577)

A test signal input is provided on the Bias Control board. When a 1/4" (6.3 mm) phone plug is inserted in this jack, the signal is bussed to the TEST SIG. input of every channel, and a DC voltage is applied to the TEST/LINE input. FED Q202 then passes the test signal; FET Q201 is simultaneously turned OFF, blocking the normal input signal. When a test signal is not plugged into the Bias Control board, the normal signal path is as follows.

The channel input circuit adopts an ACTIVE BALANCE INPUT circuit in which a transformer is not used. The signal applied to each channel passed. Past through a fully balanced, dual amplifier input stage IC201A&B. The unbalanced conversion takes place at IC202B then is carried out by FET Q201. One of the outputs goes through RV202 (the Monitor Level Calibration) to a Line Output Amp, while the other proceeds through RV201 to the output stage of the recording amplifier. IC204A and IC205A form the High speed EQ recording amplifier, where as IC204B and IC205B form the Low speed EQ recording amplifier. Adjustment of each EQ is provided at VR203 and VR205. IC206A and IC206B form the PHASE COMP. circuit at their own respective speeds.

15 ips NAB/IEC switching in the record circuitry is accomplished by FED (Q203) being switched and letting IC203B perform the selected EQ curve. This switching is a logic line derived from the bias control PCB at SW3.

NOTE: EQ circuit constant for the recording system is switchable. Conversion of the constant for the change from NAB to IEC specification or vice versa is accomplished by switching a miniature switch mounted on the Bias Control PCB card. The signal supplied from EQ stage is fed to the last stage of recording through Q205 or Q204 (Speed Select Gate). IC302 is the MIX circuit for the mixed bias and audio signal. The bias current is supplied to this MIX circuit after receiving adjustment of its ramping waveshape at IC301.

15 ips high frequency pre-emphasis record phase compensation is provided by IC206B, and adjusted by a 10-turn 10 kΩ potentiometer VR206. A 30 ips high frequency pre-emphasis is provided by IC206A, and adjusted by 1 10-turn, 10 kΩ potentiometer VR204. 15 ips EQ is selected when the logic turns ON FET Q205, and 30 ips is selected when the logic turns off Q205 and turns ON Q204.

The pre-emphasized audio from Q204 or Q205 feeds the active audio/bias mixing circuitry.

5.3.7 Audio/Bias Mixing Circuitry

PB-16KOA (PB9A577)

A master bias signal is generated on the Bias Control board and distributed to each channel's electronics, where it is amplified and mixed with the pre-conditioned audio input. A 10-turn 1- kΩ potentiometer (VR301) serves as the channel's Bias Level adjustment. The bias current is applied to IC301, the amplification stage, through R301 and C302. L301 and C301 are wave shapers. IC302 is provided with controls for the record mode and A amp voltage in Control circuit by IC516 and Q206. All the controls for the record mode are carried out by clock pulse to provide gap-free punch-in at both high and low speeds. At 30 ips, it takes about 30 ms for the bias to turn ON. The clock pulse provides an additional delay of approximately 45 ms to compensate for the distance between the erase and record heads. TP1 is a check terminal for the record bias current. This carefully synchronized turn-on not only provides gap-free punch in, it permits the machine to enter record mode without "pops" or other noises. Once in record mode, the bias and erase current ramp down in the inverse sequence.

The bias signal enters a high speed Op Amp (IC302) which mixes the audio and bias signals. Q302 and Q303 form class AB output amplifier that mixes the audio and bias (the head driver amp). The mixed bias and audio signal is applied to the record head through C308, parasitic trap L303/R317 and relay RL510. Each track on the Record Head has two identical windings. RL510 switches the windings into series for Sync Repro mode, and into parallel for Record mode to provide low impedance load for increased bias current capability.

5.3.8 Erase Head Driver

PB-16KOA (PB9A577)

The erase current is also generated on the Bias PCB Assembly and distributed to each Amp PCB Assembly. RV401 mounted on the audio PCB Assembly, is a gain adjustment for the erase current. The erase current is then fed to IC401. The clock pulse provides all the rise and fall times of the erase current. L402 and C404 are wave shapers.

The erase current is amplified at IC402 and CLASS AB AMP (Q402 and Q403) then supplied to the erase head through RL502. TP2 is a check terminal for the measurement of the erase current.

5.3.9 Reel Control Board

PB-4QHB (PB9B266)

As a system, the Reel Control board, swing arm potentiometers, motor drive amp output, and reel motors, all maintain constant the tape tension. In addition, the Reel Control board senses whether the swing arms are in the correct position to allow arming of the reel servos, or in a position that would require disarming of the servos. (Refer to the upper left hand corner of the schematic.) One half of IC8 and half of IC7 serve as comparators that receive DC voltages from the center wipers of the Supply and Take-up swing arm pots. IC8's reference voltage input comes from VR1 (the Take-up arm POS trimmer), and IC7's reference voltage comes from VR3 (the Supply arm POS trimmer). Test points TP2 and TP5 are for checking the Supply and Take-up position voltages, respectively.

The other halves of IC8 and IC7 are variable-gain inverting amplifiers, whose gain is set by trimmers VR2, 3, 4 for Tup and VR6, 7, 8 for Sup which thus set the gain for the entire servo system. IC8's output proceeds to the base of Q2 through a DC discrete component Op Amp, and differentially drives the Take-up motor drive amp output stage after leaving the Reel Control board via card edge connecter points AB13. R89 provides a negative feedback path from the Take-up reel motor ground return. The supply motor drive system is fed similarly from IC7, and output from AB18. R107 provides the negative feed-back paths from the supply reel motor ground return.

The DC output from each swing arm pot center-wiper, in addition to providing constant tension information, feeds a pair of comparators which are adjusted to indicate when the swing arm is at either extreme of its travel. Specifically, the Take-up swing arm output goes through inverting buffer IC6B to comparators IC6å and IC5A. VR9 provides the reference voltage to IC6A, and is trimmed so that D27 lights up when the swing arm is fully up (toward the rear of the deck); VR10 adjusts the reference voltage to IC5A so that D28 lights with the arm fully down. The supply swing circuit operates similarly, with VR12 adjusting the reference voltage to IC4A for the upper limit (D30), and VR11 adjusting the reference to IC3A for the lower limit (D29). the same voltage which lights the LEDs is fed through a hex inverter IC2 to the AND gates in IC1. When both upper-limit LEDs are on, then the upper AND gate's output goes negative, allowing the servos to be energized if the STOP button is pressed. Conversely, if both lower-limit LEDs are on, then the lower AND gate's output will go negative and shuts off the servo system for safety.

Section 6 Alignment

This section contains information necessary when performing the routine maintenance and occasional adjustment procedures necessary to keep the MTR-90III in peak operating condition. Many adjustments are seldom, if ever, necessary, such as those for the brakes, tape lifters, and servos. Other adjustments, such as head azimuth, will be necessary when playing tapes made on other machines. Whether or not maintenance seems to be needed, it is a good practice to check all adjustments periodically. The schedule will depend on the amount and type of use to which the MTR-90III is subjected, but a minimum of once every 6 months or 1,000 hours of operation is recommended.

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6.1 Transport Alignment

To make these adjustments, the following items are necessary:

- ❑ A suitable test tape, preferably 320 nanoWebers per meter (nWb/m) reference level. The tape should be compatible with the head format (i.e., 8, 16 or 24 track).
- ❑ A test oscillator capable of generating the following frequencies: 125 Hz, 700 Hz or 1 kHz, 10 kHz, and 15 kHz at +4 dBu or the standard operating level for the studio. In addition, the 10 kHz output should be available at -30 dBu.
- ❑ A reel of 1" or 2" recording tape of the type normally used for sessions (i.e., Scotch #226 or its equivalent).
- ❑ A non-metallic alignment screwdriver whose blade is small enough to be inserted in the trimmers of the multi-turn potentiometers on the AUDIO PCB Assemblies.
- ❑ EXTENDER PCB Assembly

6.1.1 Transport Deck Plate

The alignment/servicing procedures described in the following sub-sections of this manual may require removal of the transport cover plate for access to various components.

6.1.1.1 Opening and Closing the Transport Panel

The transport deck plate of the MTR-90III can be tilted up about 25° for very easy access to the inside of the transport.

❑ **Opening the Transport Panel**

1. Remove the two screws under the upper lip of the VU Meter Panel.
2. Open the VU Meter Panel. Take care not to drop it.
3. Remove the three screws which are located underneath on each side of the Transport Panel.
4. Lift the Transport Panel until it is fully locked into position. It is dangerous to stop lifting on the way because the deck will drop to its original position.

❑ **Closing the Transport Panel**

1. Make sure the VU Meter Panel is open.
2. Lower the Transport Panel down to the horizontal position.
3. Close the VU Meter Panel and secure with the three screws removed when opening the Transport.

CAUTION! Do not close the Transport while the VU Meter Panel is closed. Closing the Transport while the VU Meter Panel is closed will cause damage to the shield motor.

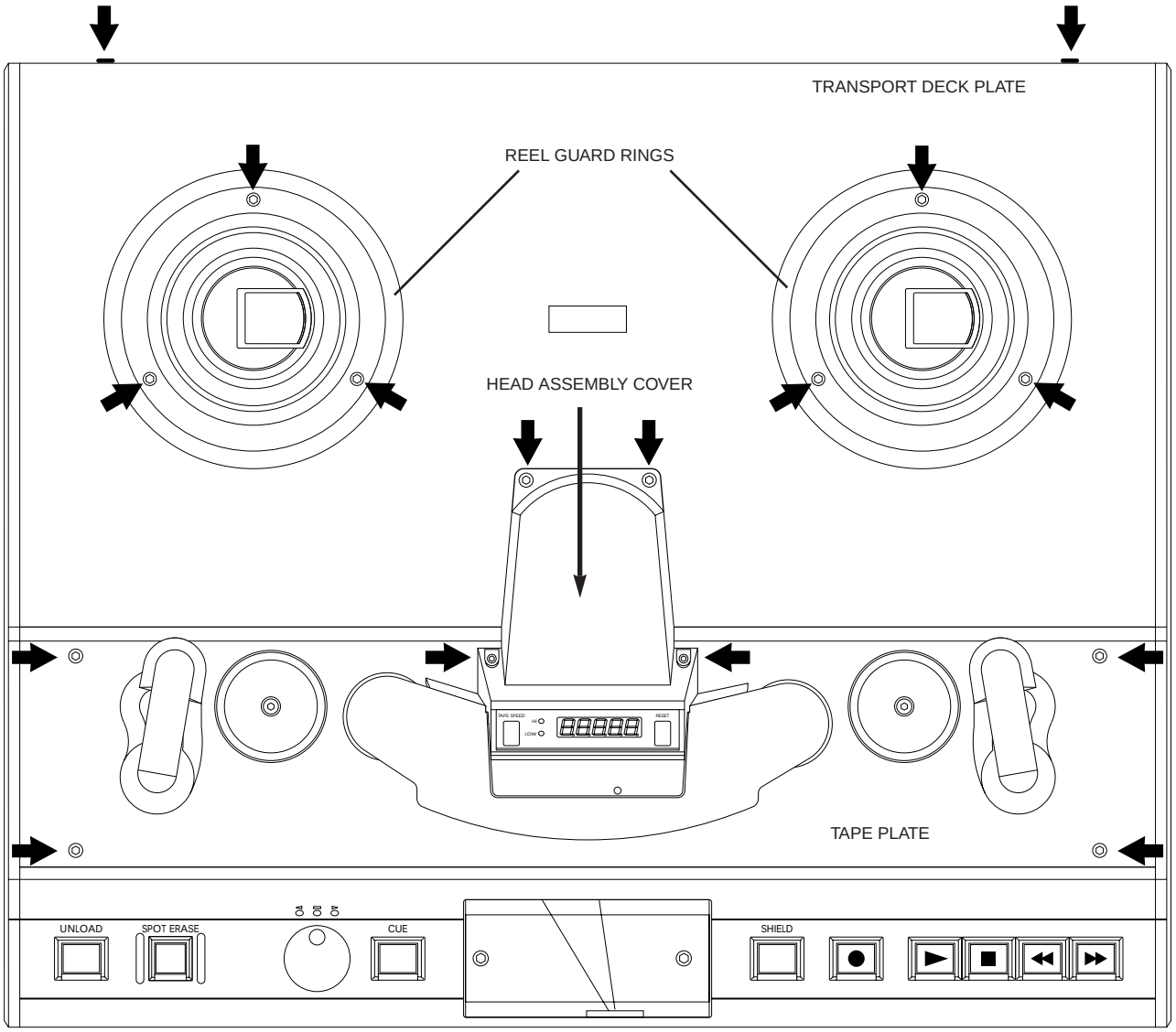


Figure 6-1
Transport Deck Plate Removal

6.1.1.2 Removing the Transport Deck Plate

Refer to **Figure 6-1** for the following instructions. The screws to be removed are indicated with black arrows.

1. Turn off the MTR-90III POWER switch.
2. Remove the Head Assembly Cover by loosening the four cap head allen screws that secure the Head Assembly Top Cover.
3. Remove the Tape Plate by loosening and removing the 4 screws securing it.
4. Remove both Reel Guard Rings (not the turntables) by removing the three allen head cap screws in each guard ring and lifting the rings straight up.
5. Remove the two oval head phillips screws, dress washers, and nylon flat washers from the rear flange of the Transport Deck Plate, lift the plate straight up and set it aside. Be careful not to scratch the tension arm rollers while removing this plate.

6.1.1.3 Reinstalling the Transport Deck Plate

Reinstall the Transport Deck Plate by installing the parts in the reverse order of **§ 6.1.1.2**.

- ❑ Make sure no loose parts, tools, wires, etc. have been left on the Transport Deck Plate.
- ❑ When reinstalling the head assembly base, be sure not to scrape the tacho roller or capstan roller with the edges of the base.
- ❑ To avoid stripped threads, do not overtighten the screws that secure the swing arm guards collars.

NOTE: Before reinstalling the Transport Deck Plate, confirm that swing arm travel, solenoid and spring tension adjustments have been completed. Refer to **§ 6.1.3** through **§ 6.1.7**.

6.1.2 Head Geometry

The MTR-90III record and reproduce heads are mounted to the head assembly block via an ingenious system that permits a simple 2-screw adjustment for azimuth (left-right tilt), without affecting the zenith (forward-back tilt), wrap (penetration of the head into the tape path) or head height. This system makes it possible for OTARI to factory set the zenith, wrap and height so that no further field adjustments are required. The only adjustment recommended is for azimuth, which maintains maximum phase coherency across the various tracks of the heads and ensures optimum high frequency response between the record and reproduce heads.

Refer to **Figure 6-2** for the location of the azimuth adjustment screws. Reproduce head azimuth must be checked and adjusted before record head azimuth can be checked.

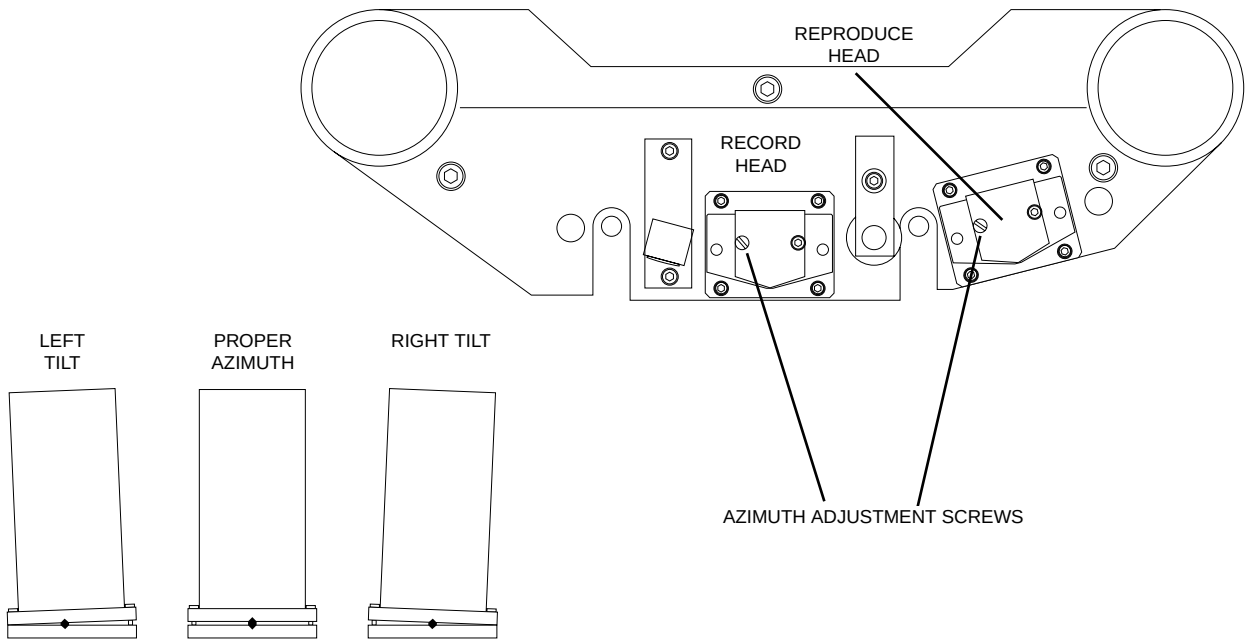


Figure 6-2
Record/Reproduce Head Azimuth Adjustment

6.1.2.1 Reproduce Head Azimuth

Reproduce Head Azimuth adjustment should be performed before Record Head Azimuth adjustment.

1. Place a test tape on the transport and connect a dual-trace oscilloscope to the outputs for CH 2 and CH 23 (or CH 2 and CH 15 on the 16 track head assembly, CH 2 and CH 7 on the 8 track head assembly).
2. Set the Transport to All Repro mode on the Remote Control Unit.
3. Play the segment of the test tape containing the 8 kHz tone for coarse adjustment.
4. Using an allen wrench, adjust the repro head for maximum phase coherence of the two traces. The head may be tilted by loosening the azimuth adjustment screw on the left (or right) and tightening the azimuth adjustment screw on the right (left) an equivalent amount.
5. For fine adjustments, play the segment of the test tape containing the 16 kHz tone and carefully adjust the tilt of the head again as required for maximum phase coherence of the two traces.

6.1.2.2 Record Head Azimuth

1. Thread a test tape on the transport; a dual-trace oscilloscope should be connected to the CH 2 and CH 23 outputs on the MTR-90III (or CH 2 and CH 15 on the 16 track head assembly, CH 2 and CH 7 on the 8 track head assembly).
2. Set the Transport to All Sync mode on the Remote Control Unit.
3. Repeat **§ 6.1.2.1** Steps 3 through 5, adjusting only the Record Head.

6.1.3 Swing Arm Travel

These adjustments should be checked and performed after every 6 months of heavy machine use or whenever a swing arm component has been damaged or replaced.

The two L-brackets on the linkage of each swing arm restrict swing arm travel when they contact a rubber-padded post screwed to the deck plate. The two hex screws secure each of the L-brackets to the linkage; the extremes of swing arm travel can be adjusted by loosening these screws and sliding the L-brackets. Check the Supply and Take-up swing arms and adjust as required. Refer to **Figure 6-3**.

1. Turn off the power to the machine.
2. Extend the REEL CONTROL PCB Assembly (PB-4HQB).
3. Attach a DC Voltmeter (DVM or VOM) to TP3 (swing arm voltage test point) and any ground (GND) test point.
4. Turn on the power to the machine.
5. Secure the swing arm at its center position. (Dots on the swing arm and on the transport deck plate indicate the center position.) The Voltmeter should read 0.0 V ± 0.03 V (30 mV). If it does not, adjust the black potentiometer under the deck plate by loosening the 2 small phillips screws that hold the potentiometer bracket in place. Be sure to tighten securely when completed.
6. Turn off the power and connect the Voltmeter to TP4 on the REEL CONTROL PCB Assembly. Repeat Steps 4 and 5 for the Supply Swing Arm.

NOTE: After the above procedure has been completed, the swing arm in its lower position should be approximately 65 mm (2.55") from the outer rib on the front of the transport deck plate. When in its upper position, the swing arm will be approximately 99 mm (3.9") from the same reference point. Refer to **Figure 6-3** for details regarding the measurement positions.

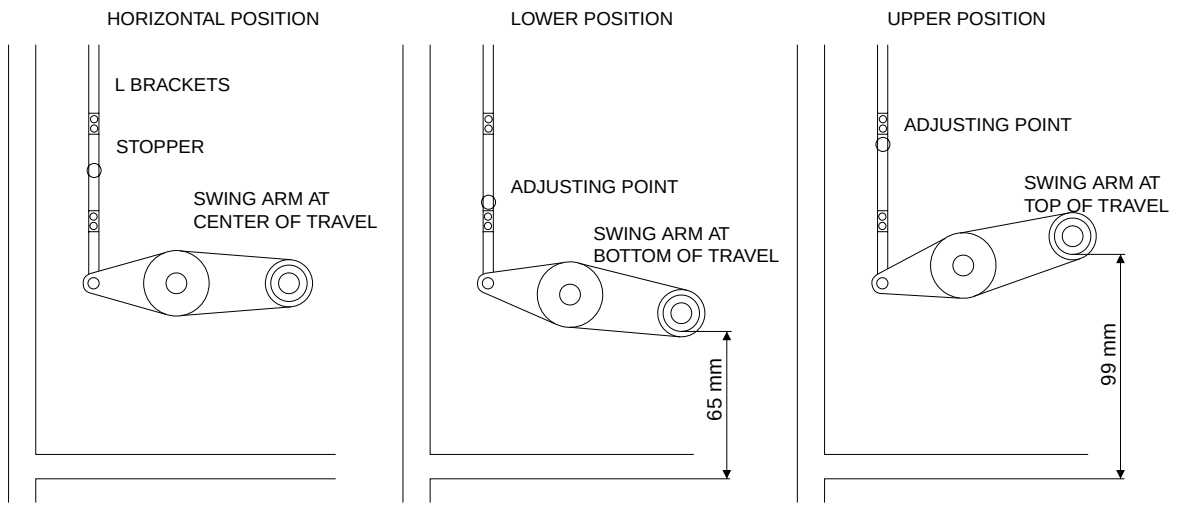


Figure 6-3
Swing Arm Travel Limit Adjustment

6.1.4 Fast Forward/Rewind Damping Solenoid Adjustment

The Fast Forward/Rewind damping solenoid can be moved back and forth after loosening the four phillips screws beneath the deck plate. Repeat the following procedure for the Supply and Take-up sides of the transport.

1. Turn off the power to the machine.
2. Hold the swing arm at the middle of its range of travel so the roller guide pin bushing is in line with the punch mark on the deck plate as shown in **Figure 6-4**.
3. Inspect the plunger in the damping solenoid. The plunger will protrude from the solenoid body toward the linkage. About 4 mm of the plunger should be visible between the body and the point where the plunger diameter is reduced for mating with the linkage (**Figure 6-4**). If necessary loosen the solenoid mounting screws and adjust its position. Be sure to average this measurement to account for possible linkage play.

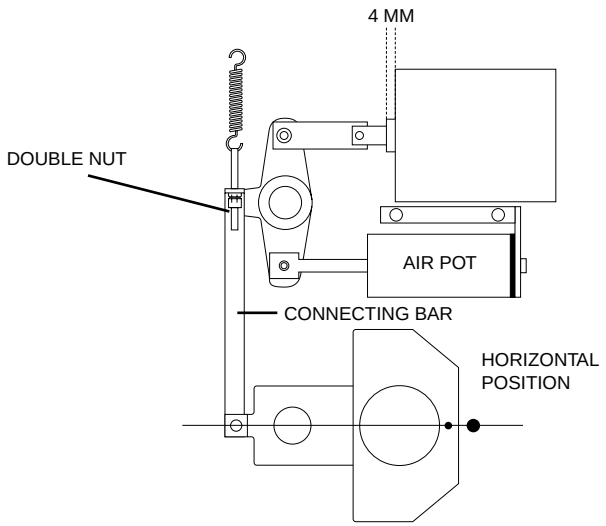


Figure 6-4
Fast Forward and Rewind Solenoid

6.1.5 Swing Arm Adjustment

When the power is on and the swing arm solenoids have been activated, the swing arm tension is solenoid controlled only in Fast Forward and Rewind modes. The tension of the coil springs on each swing arm should be checked periodically and adjusted as required to maintain accurate functioning. Repeat the following procedure for the Supply and Take-up sides of the transport. Refer to **Figure 6-3**.

1. Turn off the power to the machine.

2. Attach a spring scale to the swing arm post using a loop of string or twine.

3. Pull the scale toward the rear of the deck plate until the swing arm is in the middle position as shown in **Figure 6-3**. The mark on the swing arm and the mark on the deck plate will be in line and parallel to the front of the machine. If the spring scale indicates a reading of 460 ± 10 grams (300 ± 10 grams for 1" tapes), no adjustment is necessary.

4. Loosen the double nut by holding the portion closest to the support bracket stationary and unscrewing the other half. Then adjust the nut as required to obtain 460 ± 10 grams (300 ± 10 grams for 1") tension. For smoother operation, it is good practice to obtain the same measurement for both the Supply and Take-up swing arms ± 10 grams.

5. Tighten the double nut to lock it in place.

6. After completion of this adjustment, make sure that there is some tension on the spring even in the lower position.

NOTE: When this adjustment is correct, the tape tension measured between the swing arm and the reel should be between 260 and 300 grams (170-200 grams for 1") as measured with a Tentelometer.

6.1.6 Tape Lifter Mechanism

The two tape lifters are linked together and are adjusted at the same time. There are three different tape lifter adjustments, all of which require tape to be threaded on the transport. It makes no difference whether the deck cover plate is removed for these adjustments. Access to the lifter mechanism is obtained by opening the VU meter panel. Refer to **Figure 6-5**.

1. Thread a reel of tape on the transport, activate the solenoids and place the transport in Stop mode. There should be between 2 mm and 3 mm clearance between the tape and the closest lifter. If this clearance is correct, go to Step 3.

2. Locate the lifter solenoid beneath the deck plate. The resting position of the tape lifters can be reset by loosening the 2 hex head screws that secure the L-bracket to the flat metal linkage and sliding the L-bracket forward or back along this linkage.

CAUTION: Use great care to avoid electrical shock. Avoid touching any electrical component while adjusting mechanical components.

3. Place the transport in Fast Forward or Rewind mode. The lifters should push the tape about 2-3 mm away from the reproduce head. If this clearance is correct, go to Step 5.

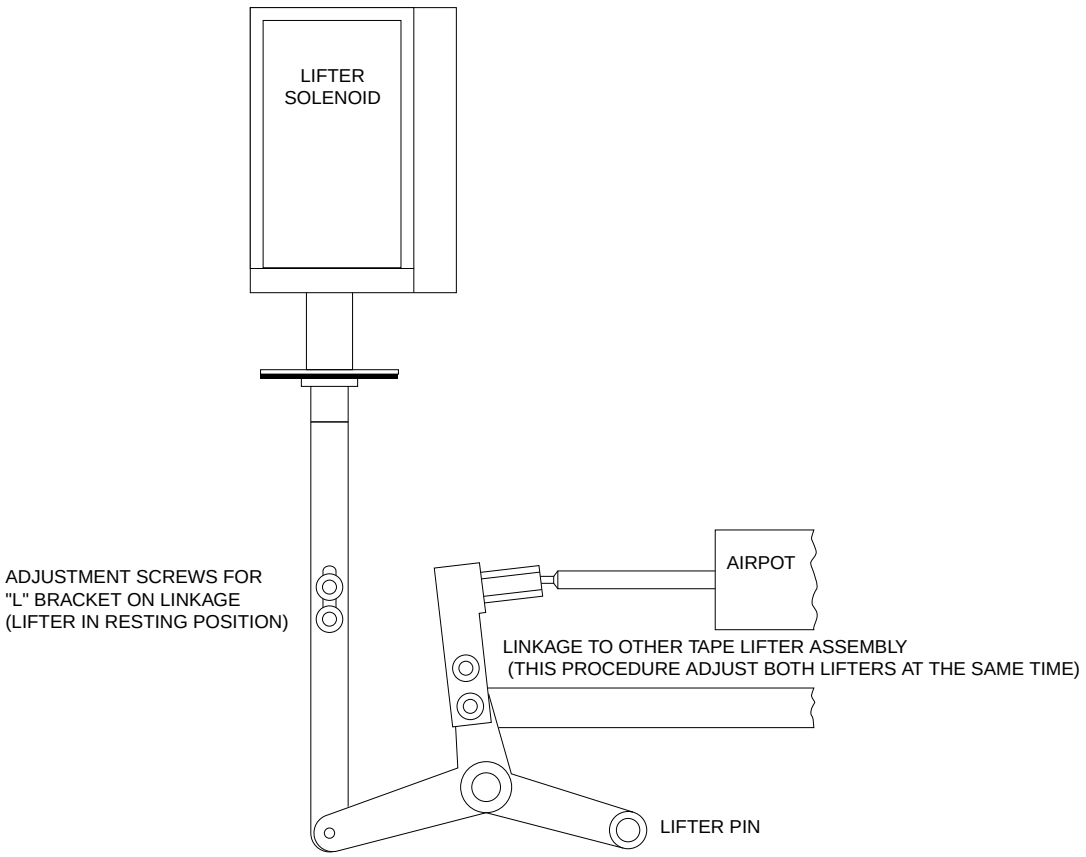


Figure 6-5
Tape Lifter Adjustment

NOTE: Components shown are an "x-ray" view, i.e., as though seen looking down on top of the deck plate. In fact, only the airpot adjustment screw is accessible from the top with the deck cover plate removed, while all parts are accessible below the deck plate.

4. The L-shaped bracket securing the solenoid is screwed to the deck plate with 2 phillips screws. The mounting holes in this bracket are slotted so the solenoid can be moved back and forth after loosening the screws. Tighten the screws securely after moving the solenoid to achieve the proper clearance between the lifters and the reproduce head.

5. Place the transport in Fast Forward mode and allow the tape to reach full winding speed. Press the PLAY button and observe the tape lifters. The tape should be lowered gently onto the heads. If it is not, turn the damping adjustment screw on the end of the air pot (accessible beneath the deck plate) clockwise to increase damping. If it take more than 1.5 to 2 seconds for the lifters to retract when going from Wind to Stop modes, turn the damping adjustment screw counterclockwise to decrease the damping. The time required for the lifters to retract should be between 0.5 and 1.5 seconds.

6.1.7 Brakes

Braking is accomplished primarily through the servo control of the reel motors. As a safety backup in case of power failure, mechanical brakes have been provided. A padded felt band is spring loaded against a brake drum attached to the reel motor shaft. The felt band is held away from the brake drum during Play, Record, Fast Forward, and Rewind modes. Only during Unload mode and when the power is off, do the brakes engage. The mechanism is designed so the holdback tension is greater than the feed tension (i.e., for the Supply reel motor, the counterclockwise tension is greater than the clockwise tension, and vice-versa for the Take-up reel motor). Repeat the following procedure for both the Supply and Take-up reel brakes. Refer to **Figure 6-6** and **Figure 6-7**.

1. Turn off the power to the machine.
2. Mount an empty 10" reel on the reel table.
3. Attach about 70 cm (2 feet) of string to a spring scale (spring gauge).
4. Check the holdback tension by winding the free end of the string around the reel hub (clockwise for Supply reel, counterclockwise for Take-up reel) and pulling on the spring scale to unwind the string. Read the tension while steadily pulling the spring scale to unwind the string. Since the reading on the spring scale is dependent upon the speed at which the string is pulled, two or three measurements should be taken and averaged. The tension should be 600 to 1000 grams (**Figure 6-6**).

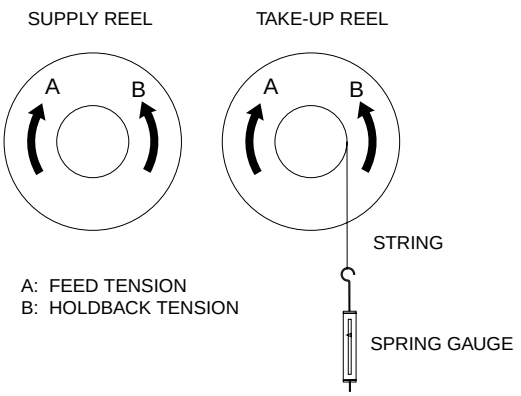


Figure 6-6
Measuring Brake Tension

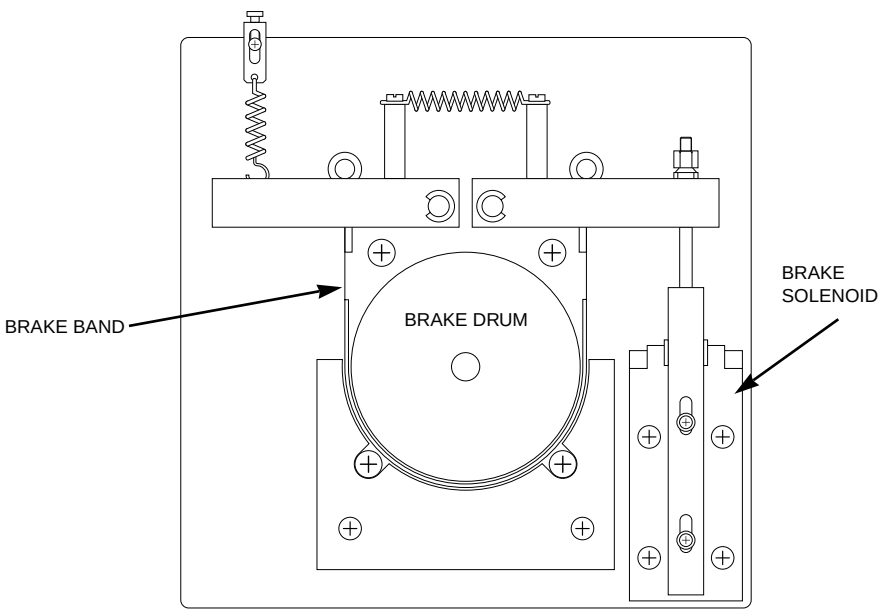


Figure 6-7
Brake Tension Adjustment Nut

NOTE: This adjustment is not critical to the performance to the machine. A 150-200 gram difference in tension between the Supply and Take-up sides is acceptable for balanced braking in case of a power failure.

5. If the tension is not within acceptable limits, loosen the tension bracket locking screw and adjust the tension adjustment nut on each brake assembly. The adjustment nuts are accessible by either removing the side panels or by lowering the VU meter panels.

6. Check the feed tension by repeating the above procedure by winding the string on the reel in the opposite direction from that used to measure the holdback tension and pulling steadily on the spring scale. The feed tension should be one-half or less of the holdback tension.

6.1.8 Reel Turntable Height

This adjustment is not necessary unless the Reel Table has been removed or the tape is obviously rubbing on a Reel Flange. The rubber surface of the Reel Table should be 1.5mm (0.06") above the Reel Table Guard Ring. If the height is not correct or if the tape rubs on a Reel Flange, adjust as follows.

1. Loosen the set screw in the hub of the Reel Table as shown in **Figure 6-8**.

2. Turn the Reel Table counterclockwise to raise it or clockwise to lower it. Each revolution of the Reel Table changes the height approximately 0.5 mm (0.02").

NOTE: Reel Table height measurement should be performed at the side of the Reel Table nearest the rear of the machine.

3. When the height is correct, lift the reel table from the motor shaft and check that the reel table set screw is aligned with the flat sides of the motor shaft. When aligned, lower the reel table and tighten the screw.

4. Run an adjustment tape through the machine to confirm that the height is correct.

CAUTION: Be sure to align the set screw with the flat side of the motor shaft. There is only one flat side of the shaft, so turn the Reel Table until the set screw is aligned with the flat side of the shaft.

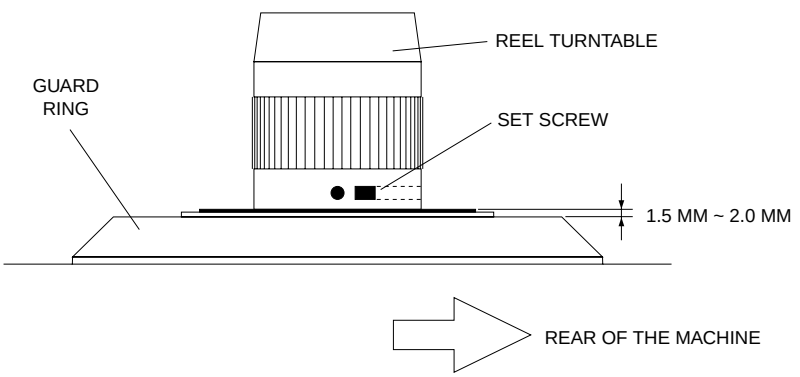


Figure 6-8
Reel Turntable Height Adjustment

6.1.9 Reel Tension Servo Adjustments

Before these adjustments can be performed, the swing arm adjustments and/or voltage measurements should be checked. Refer to **§ 6.1.5**.

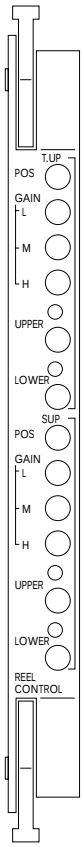


Figure 6-9
REEL CONTROL PCA Front Panel

6.1.9.1 Upper and Lower Limit Adjustment of Reel Tension

Steps 2 and 3 are necessary only if either or both tension arm assemblies have been disassembled.

1. Turn the power off. Remove the Transport Deck Plate (**§ 6.1.1.2**).
2. With the power off, extend the REEL CONTROL PCB Assembly. Turn the power on and monitor TP3 or TP4 (Take-up and Supply respectively) with a DC Voltmeter (DVM or VOM) using a Ground test point on the same PCB Assembly.
3. Mechanically adjust the swing arm potentiometer located under the deck plate by loosening the screws while securing the arms at the center position so that the DC Voltmeter indicates 0 V. Refer to **§ 6.1.5**.
4. Turn the power on, if it is not already on. With the Take-up swing arm at its resting (lower) position, adjust the T.UP LOWER trimmer (VR10) (sixth from the top on the REEL CONTROL PCB Assembly) until the yellow indicator above it turns on. Adjust VR10 so that the yellow LOWER indicator is illuminating until the Take-up swing arm moves up 2 mm from its resting position.
5. Move the Take-up swing arm just to the position at which the yellow LOWER indicator goes dark and hold it there.
6. Adjust the T.UP UPPER trimmer (fifth from the top of the REEL CONTROL PCB Assembly) until the green indicator above it turns on.

NOTE: After steps 4 to 6 have been completed, make sure that the upper and lower LEDs do not illuminate at the same time while moving the swing arm.

7. Repeat Steps 4 through 6 for the Supply swing arm adjusting the SUP UPPER and SUP LOWER trimmers (next to the bottom and on the bottom of the PCB Assembly). It is good practice to adjust the settings of the UPPER trimmers and green LEDs to be as balanced as possible between Take-up and Supply arms.

6.1.9.2 Preliminary Center Position and Gain Adjustments

Before performing these adjustments, the Swing Arm Travel adjustments should be performed as described in **§ 6.1.3**. This method of adjustment requires a digital voltmeter but needs no tape on the machine. Remove any tape and/or reels.

1. Turn off the machine and extend the REEL CONTROL PCB Assembly. Using the digital voltmeter, monitor voltage at TP1 (Take-up) or TP6 (Supply) and a ground test point on this PCB Assembly.
2. Hold the Take-up swing arm at its center position and adjust VR1 for Take-up to 0.0 Volt. Perform the same operation on Supply swing arm adjusting at VR5.
3. Next, test and adjust the voltage when the swing arm roller is manually held at the ends of the swing channel. Determine which end of the channel has the smaller absolute voltage reading.
4. Hold the swing arm at the end position where the smaller absolute value is measured.
5. Determine the reel size to be used. Refer to **Table 6-1**. Adjust the appropriate trimmer so that the corresponding voltage on the table is measured at the swing arm position held at Step 4.
6. Move the swing arm to the other end position. Confirm that the voltage measured there is within the range of ±0.7 V from the adjusted voltage in Step 5.

Table 6-1
Gain Adjustment Trimmer

Reel Size		T.P.	Voltage	Trimmer
	Less than 10.5"		*± 2.0 (1.0) V	VR4 (T.up Gain-S)
T.UP	10.5"	TP1	± 3.5 (3.0) V	VR3 (T.up Gain-M)
	14"		± 6.0 (4.0) V	VR2 (T.up Gain-L)
	Less than 10.5"		*± 2.0 (1.0) V	VR8 (Sup Gain-S)
SUP	10.5"	TP6	± 3.5 (3.0) V	VR7 (Sup Gain-M)
	14"		± 6.0 (4.0) V	VR6 (Sup Gain-L)

* When using plastic reels smaller than 10.5", these voltages must be set down to 1.4 V. Voltage values in parenthesis are for 1" machines.

NOTE: It is not recommended to use unbalanced reel sizes. When using unbalanced reel sizes, set Reel Size Dip switch(es) for the small reel side on the REEL SIZE DETECTION PCB Assembly to "7".

6.1.9.3 Tape Tension Check

1. Load a 10.5 inch reel of tape onto the transport and wind until the tape is evenly distributed between the Take-up and Supply reels.
2. While in Stop mode, use a Tentelometer or another tension gauge to check the tension on the portion of the tape between each swing arm and its adjacent reel. The tension should be between 260 and 300 grams (170-200 grams for 1").
3. If the deviation from the above specification is within ± 20 grams, use the POS trimmers on the REEL CONTROL PCB Assembly to correct the tension.
4. If the tension is more than 20 grams out of specification, **do no adjust the POS trimmers**. Instead, the swing arm spring (under the transport deck cover) must be readjusted. (Refer to **§ 6.1.5**.)

6.1.9.4 Reel Motor Tracking with Capstan

The potentiometers for adjusting the motor tracking torques are located on the TRANSPORT CONTROL PCB Assembly.

1. Turn off the power to the machine, and extend the TRANSPORT CONTROL PCB Assembly with the EXTENSION PCB Assembly.

2. Turn on the power and thread a 10.5 inch reel of tape onto the transport and wind until the tape is evenly distributed between the Take-up and Supply reels. Disconnect the capstan motor by unplugging the UNIVERSAL MATE-N-LOCK connector located to the left of the capstan motor beneath the deck plate.

3. Place the machine into Rewind mode. Using your hand, spin the capstan roller counterclockwise. Adjust potentiometer VR1 on the TRANSPORT CONTROL PCB Assembly so tape moves onto the Supply reel (about 20-30 ips). Refer to **Figure 6-10**.

4. Monitor the Capstan Tach output with a frequency counter at TP102 or TP202 on the TACH SENSOR AMP PCB Assembly mounted under the Capstan Motor (refer to **Figure 6-11**) and adjust VR1 for 600-650 Hz. The frequency may drop after a few seconds, this condition is normal if tape does not stop.

5. Place the machine into Fast Forward mode and turn the capstan clockwise. Adjust potentiometer VR2 on the TRANSPORT CONTROL PCB Assembly so tape moves onto the Take-up reel. It is important to balance the two adjustments as closely as possible. Continued rotation of the capstan roller by hand for more than 15 seconds at a time will cause invalid results.

NOTE: This is not an overly critical adjustment, but it will increase Tach and Capstan Roller slippage and affect the performance level of the CB-148 Auto Locator if grossly misadjusted.

6. Press the STOP button, turn off the power to the machine, reconnect the capstan motor and reinstall the TRANSPORT CONTROL PCB Assembly to its proper position in the card cage.

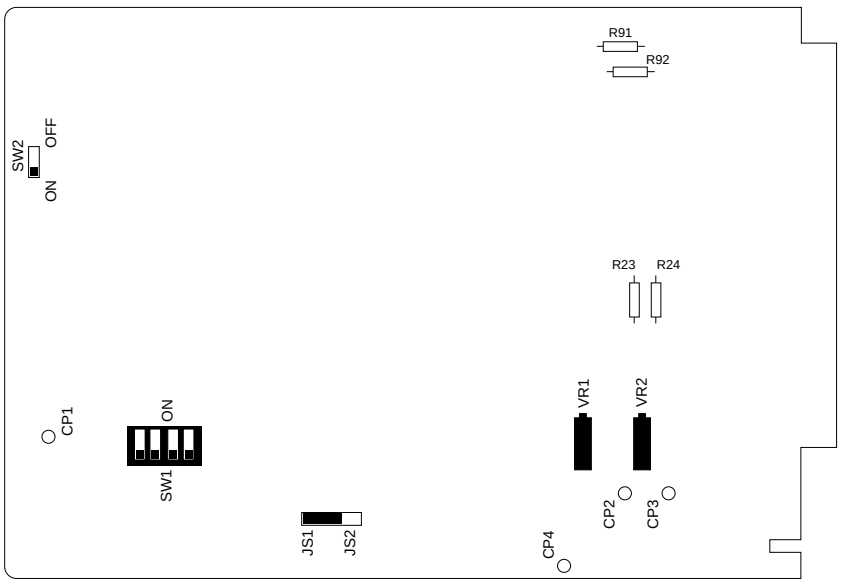


Figure 6-10
TRANSPORT CONTROL PCB Assembly

6.1.9.5 Fine Adjustment of Position and Gain

1. Turn on the power and place the machine in Rewind mode. If there is any slippage of the tape on the capstan roller, adjust the SUP POS trimmer on the REEL CONTROL PCB Assembly by turning it slowly counterclockwise until the slippage is eliminated (**Figure 6-9**). Wind time for a 10.5 inch reel (2500 feet) of 2.0 mil tape should be approximately 85 seconds (1 minute 25 seconds). Final fast wind adjustment procedures appear in **§ 6.1.10.2** and **§ 6.1.10.3**.

2. If any swing arm instability or jitter is noted, slightly reduce the setting of its GAIN trimmer (SUP GAIN or T.UP GAIN on the REEL CONTROL PCB Assembly) to eliminate the jitter. If this problem persists, it is possible that the Capstan Roller may need replacement. Contact OTARI or your local OTARI dealer for this part and technical assistance in proper installation.

6.1.9.6 Reel Size Detector Adjustment

1. The REEL SIZE DETECTION PCB Assembly (PB-4PKA) is one of the two small PCB Assemblies beneath the transport assembly. The other is an HOUR METER PCB Assembly (PB-45R).

2. Adjust VR1 (Take-up reel) and VR3 (Supply reel) so that the indicators corresponding to the potentiometer illuminate for 14" reels only and are off for all other reel sizes.

3. Reinstall the transport cover plate and confirm correct operation of the Reel Size Detectors.

6.1.10 Capstan Servo Adjustments

NOTE: Refer to the following illustrations:
Figure 6-11 for Capstan Tachometer Adjustment
Figure 6-12 for CAPSTAN CONTROL PCB Assemblies Adjustments

6.1.10.1 Capstan Tachometer Adjustment

1. Turn off power to the machine. Extend the CAPSTAN CONTROL PCB Assembly (board #2). Turn on the power.

2. Check the output of the capstan tach with a dual-trace oscilloscope connected to TP1 and TP2 of the TACHO SENSOR AMP PCB Assembly mounted under the capstan motor (**Figure 6-11A**). The signals at TP1 and TP2 should be no more than 50% different in amplitude from each other. If they are correct, skip Step 3 and continue on to Step 4.

3. Adjust the position of the capstan tach sensor to match the specifications in Step 2. Adjustment of the amplitude will also affect the phase relationship between the two signals (**Figure 6-11A**). The tach sensor is accessible by opening the meter panel and removing the capstan motor. Do not confuse this small circuit board attached to the front of the capstan motor with the tachometer roller and related circuitry located on the Supply side of the head assembly. To remove the capstan motor, remove the Transport Cover Plate and the three allen screws that secure the motor to the deck plate. Leave the capstan motor connected to the machine and support it with an object to allow it to be operated.

4. Initialize the reel servos and put the machine into Play mode. Observe the waveforms at TP1 and T 2 on the TACHO SENSOR AMP PCB Assembly with the dual-trace oscilloscope. Trigger the scope trace from the signal at TP1. Adjust VR101 and VR102 until the tach pulse waveform has a 50% duty cycle (**Figure 6-11A**).

   The phase of the signal at TP1 should lead the signal at TP2 by 90° when in Play mode. If it does not, remove the capstan motor and adjust the position of the capstan tacho sensor (Step 3). Adjustment of the phase will also affect the amplitude of the signal. It may be necessary to repeat Steps 3 and 4 several times until both amplitude and phase relationships are correct.

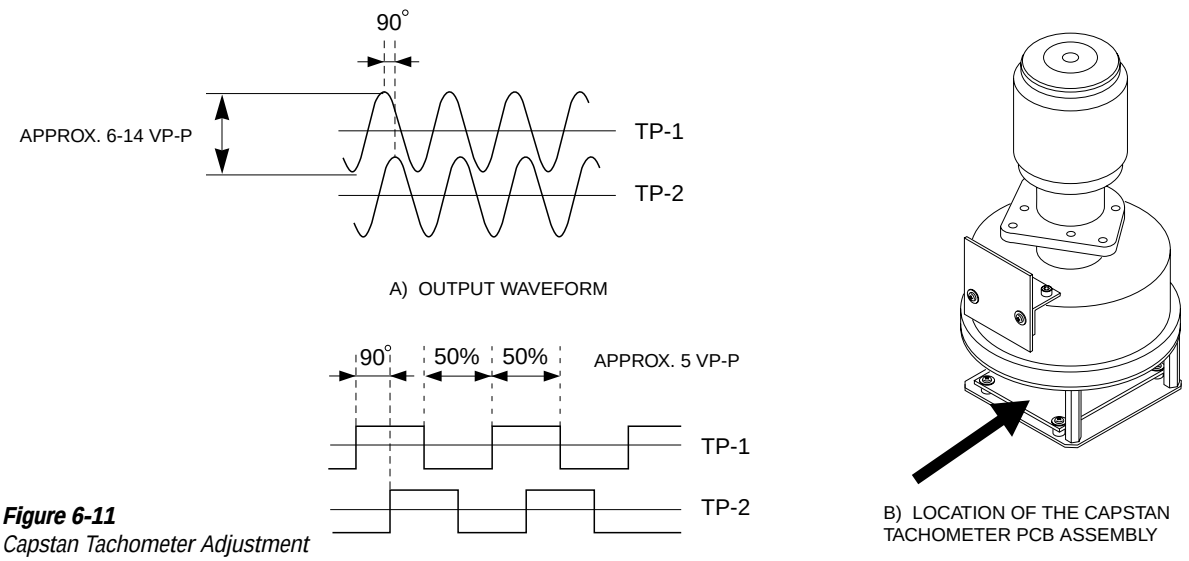


Figure 6-11
Capstan Tachometer Adjustment

6.1.10.2 Adjustment of CAPSTAN CONTROL PCB Assembly

1. Turn off power to the machine and extend the CAPSTAN CONTROL PCB Assembly.
2. Engage the reel servo system by threading the machine with tape.
3. Put the machine into Play mode.
4. Stop the machine. Adjust VR6 for 0 Volt at TP10.
5. Connect a dual-trace oscilloscope to TP1 and TP3 on the CAPSTAN CONTROL PCB Assembly. Turn the power on.
6. Put the machine into Play mode and confirm that both waveforms have 50% duty cycles and TP1 leads the waveform at TP3 by 90°.
7. Monitor TP1 or TP3 with a frequency counter.
8. Adjust VR4 FAST DAMP on the CAPSTAN CONTROL PCB Assembly (front panel) to the center of its adjustment range.
9. Put the machine into Fast Forward or Rewind mode and adjust VR3 FAST GAIN on the CAPSTAN CONTROL PCB Assembly (front panel) to the center of it adjustment range.

NOTE: Adjustment to the wind frequencies should be made after the speed stabilizes.

6.1.10.3 Fast Wind Speed Adjustment

1. Turn off the power and extend the I/O CONTROL PCB Assembly.
2. Adjust VR1 FAST SPEED on the I/O CONTROL PCB Assembly (front panel) to the maximum clockwise position and simultaneously adjust VR2 on the REEL SIZE DETECTION PCB Assembly (PB-4PKA) to the maximum clockwise position.
3. Turn on the power to the machine and put the machine into Fast Forward or Rewind mode. Compare the frequency readings in Fast Forward and Rewind modes. If the difference is 1000 Hz or greater; go to Step 9.
4. Adjust VR3 on the I/O CONTROL PCB Assembly to obtain frequency reading of 68 kHz ±0.5 kHz.
5. Stop the machine and press CUE to enter Cue Shuttle mode.
6. Adjust VR2 on the I/O CONTROL PCB Assembly to obtain a frequency reading of 900 Hz - 1 kHz in cue shuttle mode (at bit-1 speed). (Yellow indicator flashing, arrow solidly lit.)

NOTE: When observing the frequency in Reverse Cue mode the frequency will be slightly higher. This condition is normal.

7. Remove the Extension PCB Assembly and observe the counter for 600 - 800 Hz at bit-1 speed. Extend the card and readjust if necessary to obtain 600 - 800 Hz with the Extension PCB Assembly removed. The Extension PCB Assembly causes a noticeable frequency difference. This condition is normal.

8. Put the machine into Fast Forward or Rewind and adjust VR1 FAST SPEED on the I/O CONTROL PCB Assembly (front panel) to obtain a frequency reading of 64 kHz.

NOTE: If VR1 is left fully clockwise, a time delay will occur when going from fast wind modes to other modes of operation.

9. Wind the tape until there is an equal amount of tape on the Supply and Take-up reels. Check the Fast Forward and Rewind frequencies. They should be no more than 500 Hz apart. If there is a difference of more than 500 Hz, extend the CAPSTAN CONTROL PCB Assembly and adjust VR5 for equal Fast Forward and Rewind speeds.

10. Verify that the frequencies observed during Steps 7 and 8 are still correct as some interaction of the trimmers may have occurred.

Turn VR2 on the REEL SIZE DETECTION PCB Assembly counterclockwise to find the point where the frequencies start decreasing. Then turn VR2 clockwise 180 degrees from that point.

11. Remove the Extension PCB Assembly and reinstall the CAPSTAN CONTROL PCB Assembly. Thread the machine with a tape containing a pre-recorded 1 kHz sine wave. With the tape at the beginning of the reel (heads) put the machine into Play mode.

12. Using an oscilloscope, monitor the XLR line outputs and check the time required for the tape to reach play speed (i.e., for the signal on the scope to reach 1 kHz). To reach 15 ips should take 0.5 seconds, to reach 30 ips, 0.8 seconds. If the tape is not getting up to speed in the appropriate time, adjust the Play Gain VR1 (front panel of the CAPSTAN CONTROL PCB Assembly) clockwise. If the tape is overshooting the speed, turn the VR1 trimmer counterclockwise to minimize the overshoot. Return to the beginning of the reel to confirm start-up and overshoot specification.

13. While still in Play mode adjust VR2 PLAY DAMP (front panel of CAPSTAN CONTROL PCB Assembly) counterclockwise until the tension arms start showing instability, then turn VR2 clockwise until the tension arms stabilize. Once stability is achieved continue turning the trimmer clockwise 2 more full rotations.

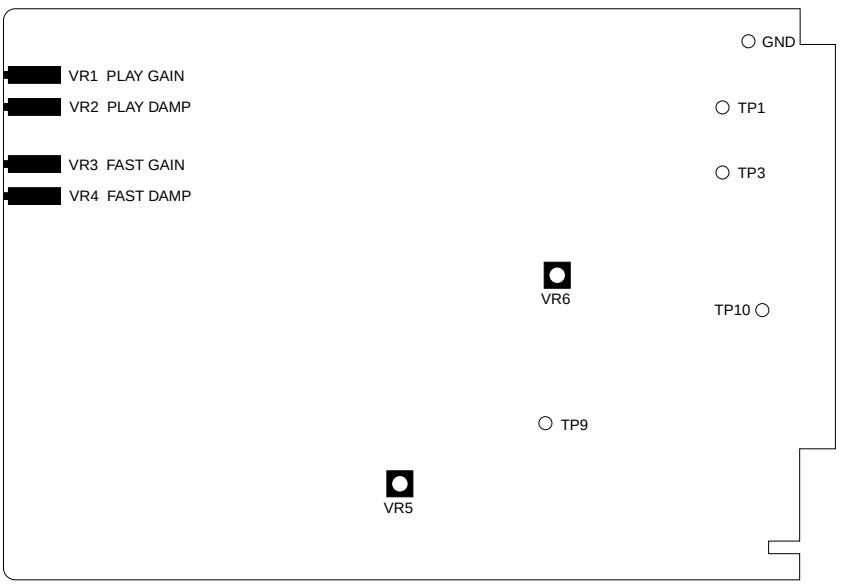


Figure 6-12
CAPSTAN CONTROL PCB Assembly

6.1.11 Adjustment of TRANSPORT CONTROL PCB Assembly

Refer to "Reel Motor Tracking with Capstan" **§ 6.1.9.4** for the procedure on adjusting VR1 and VR2.

6.1.12 Adjustment of MASTER CPU PCB Assembly

1. Turn off the power to the machine and extend the MASTER CPU PCB Assembly.
2. Connect the Remote Control Unit to the tape machine. On the Remote Control Unit select Vari speed mode and speed indication in percent.
3. Insure that the indicator on the front panel turns green about 3 seconds after the power is turned on.
4. Adjust VR1 on the MASTER CPU PCB Assembly so that the VARI speed control has an equal range of pitch adjustment from approximately +24% to -24%.

6.1.13 VU Meter Calibration

NOTE: These adjustments are required only when initially setting up the machine or when changing standard operating levels.

1. Extend the BIAS PCB Assembly (board #7).
2. Apply a 1 kHz signal at +4 dBu (or whatever standard operating level has been chosen) to the Channel 1 LINE INPUT connector.
3. Switch the CH 1 Output Monitor Selector to INPUT position (yellow indicator illuminated).
4. Monitor the LINE OUTPUT of CH 1 with a dBu meter or a sensitive AC Voltmeter.
5. Adjust the MONI control on the front panel of the CH 1 AUDIO PCB Assembly for an output of +4 dBu (or whatever standard operating level has been chosen).
6. The MTR-90III VU meter should indicate 0 VU. If it does not, open the VU meter panel by removing the 3 screws along the upper edge of the panel and pivot the meter panel down to the horizontal position.
7. Adjust the VU meter calibration trimpot on the back of the meter panel for 0 VU indication.
8. Apply the test signal (1kHz at +4 dBu) to the TEST SIGNAL jack on the front of the BIAS PCB Assembly. This jack accepts a 6.3 mm (1/4") tip-sleeve phone plug. Adjust VR5 so that the CH 1 LINE OUTPUT is +4 dBu.
9. Repeat Steps 4, 5 and 7 for each of the remaining channels 2-24. (Note that VU meter calibrate trimmers are labeled VR101 for CH 1; VR 201 for CH 2; VR301 for CH 3; etc.)
10. When all channels have been completed, turn off the power and remove the BIAS CONTROL PCB Assembly from the Extension PCB Assembly. Remove the Extension PCB Assembly from the machine and reinstall the BIAS CONTROL PCB Assembly in the machine.

6.2 Audio Alignment

6.2.1 Reproduce Amp Alignment

1. Check to make sure the LOW FREQ COMP switch on the BIAS CONTROL PCB Assembly (board #7 in the lower card cage) is in the OFF position. The LOW FREQ controls on the AUDIO PCB Assemblies are normally adjusted only in Record/Reproduce mode, unless the machine is being aligned to prerecorded alignment tones from a session at another studio.

2. Check the Remote Control Unit to make sure the ALL SAFE and ALL REPRO buttons are engaged.

3. Thread the Reproduce Alignment tape on the transport and press the STOP button to initialize the servos.

4. Set the TAPE SPEED to the speed corresponding to the speed of the test tape in use.

5. Set the SPEED MODE switch on the Remote Control Unit to the FIX position.

6. Locate the 700 Hz or 1 kHz reference tone and press the PLAY button.

7. The VU meters should indicate 0 VU. If any do not, adjust the REPRO GAIN control on the corresponding AUDIO PCB Assembly as required (**Figure 6-12**).

8. Locate and play the 10 kHz reference tone.

9. Adjust the REPRO HI SPD EQ or REPRO LOW SPD EQ on the AUDIO PCB Assembly for each channel as required (depending upon the tape speed selected) to obtain a 0 VU indication for that channel.

10. Locate and play the 15 or 16 kHz reference tone. The VU meters should be within 1 dB of 0 VU.

NOTE: As a convenience, the MTR-90III is provided with a fixed low frequency equalization characteristic that suit most applications. If, however, different characteristic are required (i.e., a tape from another studio), the MTR-90III can be realigned with a custom-tailored low frequency EQ.

11. Set the LOW FREQ COMP switch on the BIAS PCB Assembly to the ON position. Adjust the LOW FREQ trimmer on the AUDIO PCB Assemblies to achieve the desired low frequency response using the 100 Hz setup tone on the session tape.

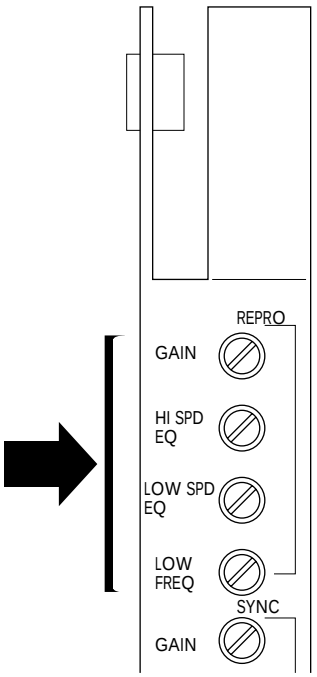


Figure 6-13
Repro Section of AUDIO PCB Assemblies

6.2.2 Sync Amp Alignment

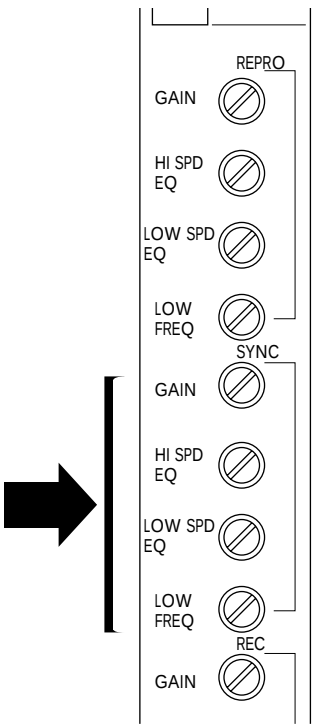


Figure 6-14
Sync Section of Audio PCB Assemblies

1. Engage the ALL SEL·REP button on the Remote Control Unit. ALL SAFE should still be engaged.
2. Rewind the test tape and locate and play the 1 kHz reference tone.
3. The VU meters should indicate 0 VU. If any do not, adjust the SYNC GAIN control on the corresponding AUDIO PCB Assembly as necessary (**Figure 6-13**.)
4. Locate and play the 10 kHz tone on the alignment tape.
5. Adjust the SYNC HI SPD EQ or SYNC LOW SPD EQ on the AUDIO PCB Assembly for each channel as required (depending on the tape speed selected) to obtain a 0 VU indication for that channel.
6. Locate and play the 15 or 16 kHz reference tone. The VU meters should be within 1.5 dB of 0 VU.
7. If a reproduce alignment tape is used for initial audio alignment, the LOW FREQ COMP switch on the BIAS PCB Assembly should be in the OFF position. If the machine is being aligned to setup tones recorded on a session tape, turn the LOW FREQ COMP switch on the BIAS board to the ON position and use the 100 Hz setup tone to adjust each AUDIO PCB Assembly SYNC LOW FREQ EQ for the desired low frequency response.

6.2.3 Bias Alignment

Three master bias controls are switch-selected so that once the individual channels have been brought into proper bias balance, a single control can reset the bias to accommodate up to three different tape formulations.

1. Extend the BIAS PCB Assembly (card #7 in the lower card cage).
2. Set the BIAS SELECT switch (SW1) to the **1** position.
3. With an oscilloscope connected to TP-1 on the BIAS PCB Assembly, adjust VR1 (BIAS ADJ. 1) for 5 V P-P signal.
4. Thread a reel of blank tape on the machine.
5. Plug a test oscillator into the TEST SIGNAL jack on the front of the BIAS PCB Assembly. This jack accepts a tip-sleeve 6.3 mm (1/4") phone plug.
6. Set the oscillator for +4 dBu output at 10 kHz.
7. On the Remote Control Unit, engage the ALL INPUT switch so the test input signal can be monitored to check if it is present.
8. Now switch the Remote Control Unit to All Repro mode, disengage the ALL SAFE button and set all READY/SAFE switches to READY position.
9. Press the RECORD and PLAY buttons to initiate recording of the 10 kHz test signal.

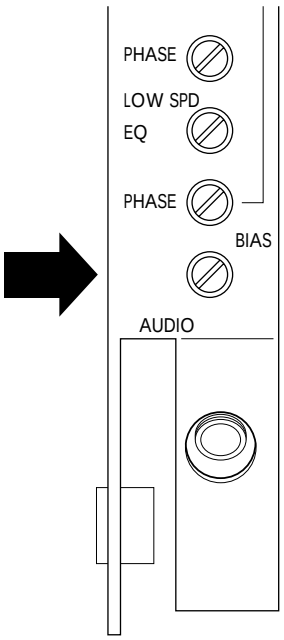


Figure 6-15
Bias Section of Audio PCB Assemblies

10. Turn the BIAS control on the AUDIO PCB Assembly counterclockwise until the indication on the VU meter begins to drop. If the control is already fully counter-clockwise, turn the BIAS control clockwise until the indication on the VU meter peaks. Then continue clockwise rotation until the VU meter reading decreases (overbias). Refer to the BIAS CHART (**Table 6-2**) to determine the amount of overbias that is correct for your tape and speed.

11. Turn down the test oscillator if the peak indication is over 0 VU.

12. Repeat Step 10 to re-check the bias alignment before proceeding to the next channel.

13. Repeat Step 10 for each of the remaining channels 2-24.

14. When all channels have been aligned for proper bias level, unplug the test oscillator from the TEST SIGNAL jack.

NOTE: For subsequent bias alignments where the only change is to a different tape formulation, the above procedure need not be followed. Apply a 10 kHz signal to the TEST SIGNAL jack or from the console, select the **2** or **3** BIAS SELECT switch position on the BIAS CONTROL PCB Assembly and adjust the corresponding BIAS LEVEL control below the switch while the tape is recording. In this way, all channels are biased properly with only one adjustment.

Table 6-2
Bias Chart

TAPE TYPE	SPEED					
	30 IPS		15 IPS		7.5 IPS	
	OVERBIAS dB	ALIGN FREQ kHz	OVERBIAS dB	ALIGN FREQ kHz	OVERBIAS dB	ALIGN FREQ kHz
SCOTCH 226	+4.0	20 kHz	+3.5	10 kHz	+6.5	10 kHz
SCOTCH 250	+3.0	20 kHz	+3.0	10 kHz	+6.5	10 kHz
AMPEX 406	+4.0	20 kHz	+3.5	10 kHz	+6.5	10 kHz
AMPEX 456	+4.5	20 kHz	+4.0	10 kHz	+6.5	10 kHz
BASF PEM 468	+1.0	20 kHz	+2.5	10 kHz	+5.5	10 kHz
BASF 911	+1.5	20 kHz	+2.5	10 kHz	+5.0	10 kHz

6.2.4 Record Alignment

1. Thread a reel of blank tape on the machine.

2. Connect a test oscillator or, preferably, the oscillator in the mixing console to the LINE INPUT connectors of the machine.

3. Set the oscillator or console for 0 VU (or the operating level chosen to correspond to 0 VU, i.e., +4, +6, or +8 dBu) at 700 Hz or 1 kHz.

4. Set the TAPE SPEED switch to the desired speed (HI or LOW) and set the SPEED MODE switch on the Remote Control Unit to the FIX position.

NOTE: Record Bias alignment should be complete before performing the following procedures. Refer to **§ 6.2.3**.

5. Engage the ALL REPRO button on the Remote Control Unit, disengage the ALL SAFE button and set all the READY/SAFE switches to the READY position.

6. Press the RECORD and PLAY buttons to initiate recording of the test signal.

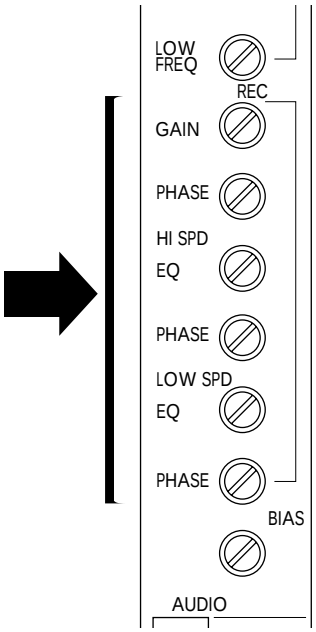


Figure 6-16
Record Section of Audio PCB Assemblies

7. All the VU meters should now indicate 0 VU. If any do not, adjust the RECORD GAIN control on the corresponding AUDIO PCB Assembly as required (**Figure 6-15**).

8. Switch the test or console oscillator to provide a 10 kHz signal at 0 VU to the inputs.

9. All the VU meters should now indicate 0 VU. If any do not, adjust the RECORD HI SPD EQ (or RECORD LOW SPD EQ) as required to obtain a 0 VU indication for that channel.

10. Switch the oscillator to 15 kHz at 0 VU level. The VU meters should be within 1 dB of 0 VU.

11. Switch the oscillator to 1 Khz at 0 VU level and confirm that the record level is still 0 VU. If necessary, repeat Steps 7-10.

12. Push the STOP button and engage the ALL INPUT button on the Remote Control Unit.

13. Apply the 1 kHz, 0 VU signal from the oscillator or the console again.

14. Adjust the MONI (monitor) control on each AUDIO PCB Assembly to obtain a 0 VU meter indication. This matches the input sensitivity and monitor level of the MTR-90III to the output level of the mixing console.

6.2.5 Record Phase Compensation

Adjustable record phase compensation networks are provided for the record amplifier circuitry. These networks enable the circuit to be optimally compensated for group delay introduced by the record equalization circuitry with separate adjustments for both operating speeds. The result is superior transient and square wave response as well as higher recording level capability with complex waveforms before saturation occurs.

The following procedure assumes that the bias, level, and equalization have been calibrated according to the above instructions and that LF COMP on the BIAS CONTROL PCB Assembly is switched off.

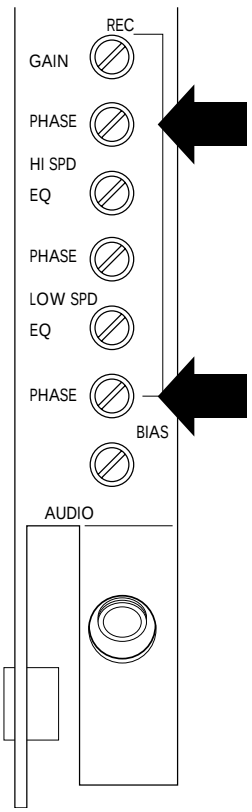
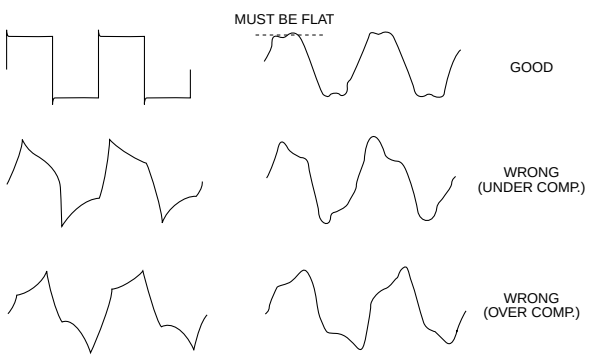


Figure 6-17
Phase Compensation Adjustments

1. Connect an oscilloscope to the LINE OUTPUT of one track.

2. Apply a square wave of 1 kHz (5 kHz if available) at 0 VU for 15 ips or 10 kHz at 0 VU for 30 ips to the inputs.

3. Switching the Output Monitor selector between REPRO and INPUT (or SEL·REP), adjust the LOW PHASE control or the HI PHASE control (depending upon the tape speed selected) on the AUDIO PCB Assembly being monitored until the repro signal is most similar to the input signal. Refer to **Figure 6-16**.



6.2.6 Erase Current Adjustment

1. Turn off the power to the machine.
2. Extend the BIAS CONTROL PCB Assembly (Board #7).
3. Turn on the power to the machine.
4. Use an oscilloscope to monitor the waveform at TP2 on the BIAS CONTROL PCB Assembly with the group lead of the scope connected to a GND test point on the PCB Assembly.
5. Adjust VR-4 on the BIAS CONTROL PCB Assembly for 5 V P-P waveform.
6. Turn off the power to the machine.
7. Remove the Extension PCB Assembly and reinstall the BIAS CONTROL PCB Assembly to its correct slot.
8. Extend the CH 1 AUDIO PCB Assembly.
9. Turn on the power to the machine.
10. Thread the machine with tape, engage the servo system and put all tracks into Record Mode.
11. Connect an oscilloscope to TP2 and the adjacent GND point on the AUDIO PCB Assembly.
12. Turn VR401 on the AUDIO PCB Assembly (located near the bottom rear of the PCB Assembly) slowly clockwise until a triangle wave just starts to appear. Then turn VR401 counterclockwise until the top and bottom peaks just round out. This should set the peak to peak amplitude to approximately 3 V.

NOTE: If a triangle waveform is already present at TP2, turn VR401 counterclockwise first and then adjust for a triangle waveform as above.

13. Repeat Steps 8 through 12 for all 24 channels to complete the procedure.

6.2.7 Gain Structure

Figure 6-17 is a block diagram of the audio signal path for one channel for the 24-track MTR-90III (8 and 16 track versions may differ slightly). On it are indicated the nominal signal levels in dBu (ref. 0 dB=0.775 V RMS) given a 1 kHz signal with NAB EQ at 30 ips.

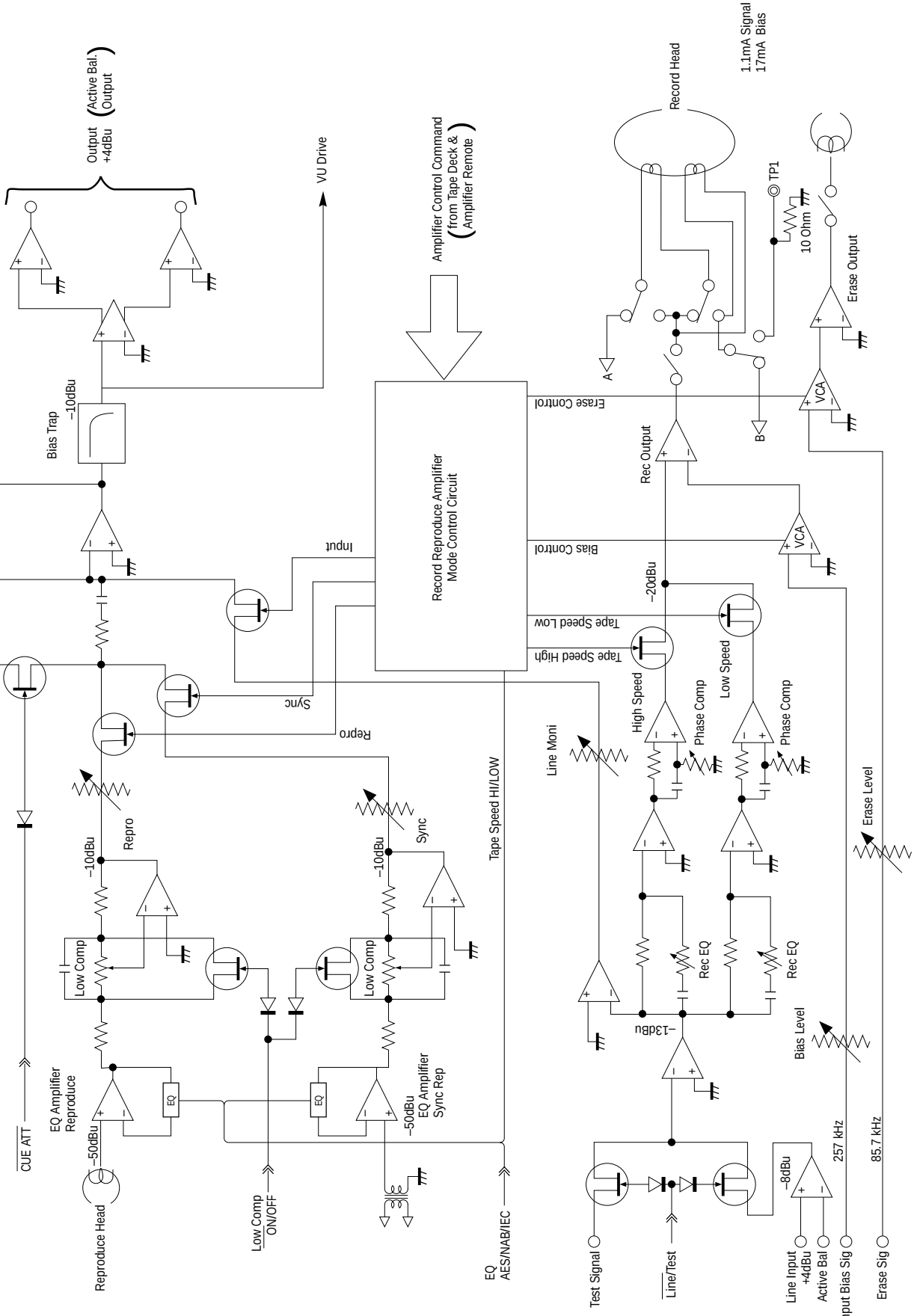


Figure 6-18
MTR-90III Block Diagram

Section 7 Specifications

7.1 Tape Transport 7-2

7.2 Electronics (Measured with AMPEX #456 Tape) 7-3

7.3 Physical 7-4

7.4 Accessories 7-5

7.1 Tape Transport

Tape Width And Tracks	1-inch (25.4 mm) 8 tracks* *manufactured to order 2-inch (50.8 mm) 16 tracks 2-inch (50.8 mm) 24 tracks
Heads	Plug-in head blocks with full access to independent head azimuth adjustment.
Motors	1 DC capstan motor; 2 fully servoed DC reel motors.
Reel Size	Up to 14 inches diameter (35.63 cm) NAB hub with reel size auto sensing
Tape Speed	30 ips (76.2 cm/s) and 15 ips (38.1 cm/s) 15 ips (38.1 cm/s) and 7.5 ips (19.05 cm/s)* *manufactured to order
Tape Speed Accuracy	max. ±0.1%
Tape Speed Deviation	max. 0.05% (from beginning to end of reel.)
Pitch Control	±20% continuously variable control, percentage or ips readout with 0.01% precision.
Wow and Flutter (Peak wtd. per DIN 45507)	30 ips: max. ±0.04% 15 ips: max. ±0.05% 7.5 ips: max. ±0.08%
Start Time (with 14" reels)	30 ips: max. 1.0 second 15 ips: max. 0.6 second 7.5 ips: max. 0.5 second
Stop Time (with 14" reels)	30 ips: max. 1.0 second 15 ips: max. 0.6 second 7.5 ips: max. 0.5 second
Fast Wind Time	min. 85 seconds for 2400 feet (760 m) tape.
Drive System	Pinchrollerless direct drive capstan system with ±20% speed control. Constant tension servo-controlled reel motors.
Cue Control	Rotating Cue knob for variable speed tape winding (bidirectional) proportional to cue knob rotating; button also defeats tape lifters in fast wind and rewind modes.
Tape Time Counter	Six-digit LED readout from tachometer/logic measurement circuit; indicates hours, minutes, seconds, and tenths of seconds.

7.2 Electronics (Measured with AMPEX #456 Tape)

Line Input

Transformerless Active Balanced (Floating transformers are optional)
Input Impedance: 10 kΩ (20 Hz to 20 kHz)
Nominal Level: +4 dBu
Connectors: XL-3 type, Female

Line Output

Transformerless Active Balanced (Floating transformers are optional)
Output Impedance: 5 Ω (20 Hz to 20 kHz)
Load impedance: min. 150 Ω
Nominal Level: +4 dBu
Balanced/Unbalanced switchable
Connectors: XL-3 type, Male

Amplifier Clipping

+28 dBu

Headroom

24 dB

Equalization

30 ips: AES
15 & 7.5 ips: NAB or IEC (CCIR), switchable
Record EQ to be specified at time of order.

Punch In/Punch Out

Gapless and noiseless inserts with automatic monitor switching.

Standard Record Level

320 nanoWebers per meter (nWb/m).

Frequency Response

Rec/Rep
30 ips: 50 Hz to 22 kHz + 2 dB, -3 dB (0 VU)
15 ips: 30 Hz to 20 kHz + 2 dB, -3 dB (0 VU)
7.5 ips: 30 Hz to 16 kHz + 2 dB, -3 dB (-10 VU)

Rec/Sel·Rep
30 ips: 50 Hz to 16 kHz ± 3 dB (0 VU)
15 ips: 30 Hz to 16 kHz ± 3 dB (0 VU)
7.5 ips: 30 Hz to 12 kHz ± 3 dB (-10 VU)

Distortion

max. 0.5% THD at 1 kHz, 320 nWb/m.

Crosstalk

24 track: 1 kHz, min. 55 dB
16 track: 1 kHz, min. 58 dB
8 track: 1 kHz, min. 58 dB
16 and 24 track: 200 Hz to 16 kHz, min. 43 dB

Erase Efficiency

min. 75 dB at 1 kHz

Signal-to-Noise Ratio

(Rec Level: 1040 nWb/m)

			UNWTD*	ANSI "A"	DIN 45405 audio
MTR-90III-8 & 16	**AES**	**30 ips**	72 dB	74 dB	71 dB
	IEC	**15 ips**	71 dB	73 dB	69 dB
		7.5 ips	68 dB	70 dB	66 dB
	NAB	**15 ips**	69 dB	71 dB	67 dB
		7.5 ips	71 dB	73 dB	69 dB
MTR-90III-24	**AES**	**30 ips**	70 dB	73 dB	70 dB
	IEC	**15 ips**	69 dB	71 dB	67 dB
		7.5 ips	66 dB	68 dB	64 dB
	NAB	**15 ips**	67 dB	69 dB	65 dB
		7.5 ips	69 dB	71 dB	67 dB

(*measured through 30 Hz to 18 kHz audio filter)

Reference Fluxivity

NAB: 250 nWb/m
IEC: "320" nWb/m
Figures enclosed in quotations (" ") represent values for open circuit fluxivity.

Bias Frequency

257 kHz

Erase Frequency

86 kHz

7.3 Physical

Weight	approx. 200 kg (440 pounds)
Dimensions	1,085 mm (H) X 770 mm (W) X 620 mm (D) [43" (H) X 30" (W) X 24-1/2" (D)]
Finish	Light beige and gray pebble finished steel chassis, black cover panels.
Power Supply	100/117/220/240 V ±10% single phase AC, 50 Hz or 60 Hz
Power Consumption	Normal 1 kVA Max. 2,000 VA
Operating Environment	Temperature: +5˚C to +40˚C Relative Humidity: 20% to 80%
Storage Environment	Temperature: -20˚C to +45˚C Relative Humidity: 10% to 80%

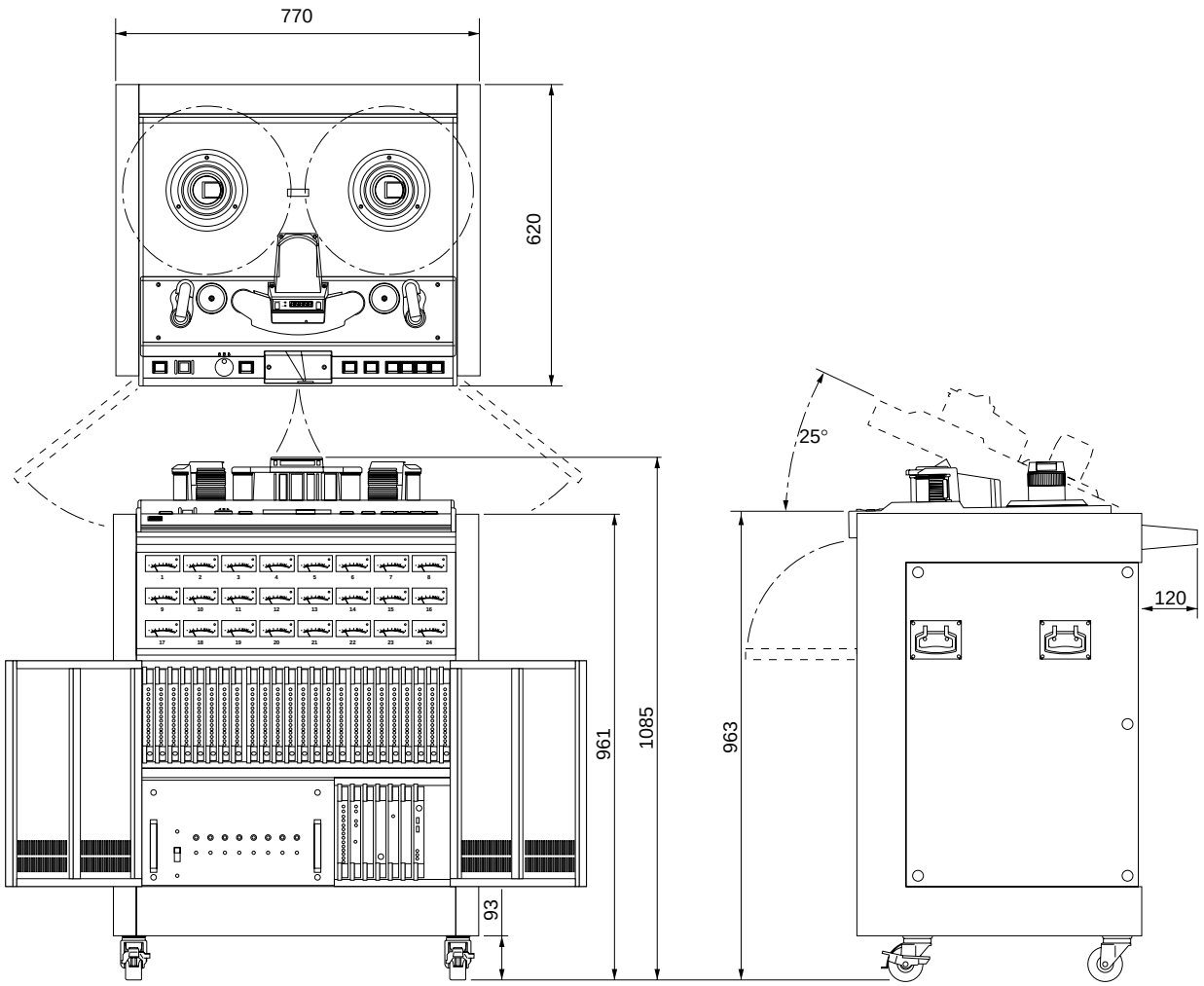


Figure 7-1
MTR-90III Dimensions

7.4 Accessories

Standard Accessories

CB-147-S	Remote Control Unit	x 1
FH7F0015	150 mA, 125 V Fuse	x 1
FH9-026	630 mA Slow Blow Fuse	x 1
FH7H100	10 A, 250 V Fuse	x 1
LU2070	28 V Lamp for VU meter	x 5
LU2077	28 V Lamp for Push Switch (OMRON)	x 5
LU2007	Lamp for Puch Switch (EAO)	x 1
CY4032	Frame Bumper	x 2
PZ9D019	Power Supply Cable	x 1
CN7C-015	3 P Plug Cord	x 1
ZA-63B	Amplifier Control Cable Assembly	x 2
ZA-63C	Deck Control Cable Assembly	x 1
CN7C-014	Dummy EXT Connector Assembly	x 1
OS3-304	Operation and Maintenance Manual	x 1

Optional Accessories

CB-120S	Auto Locator
CB-120BS	Auto Locator
CB-148-S	Auto Locator
EC-101-S	Plug-in Synchronizer
CB-121-S	Synchronizer Remote Controller for EC-101
EC-102-S	Chase Synchronizer
CB-131-S	Synchronizer Remote Controller for EC-102
ZA-55S	Capstan Clock Pre-scaler
ZA-52J	Roll-around stand for Locator/Controller
ZA-54L	Large Diameter Caster [d = 125 mm]
ZA-53C	Input Transformer Assembly
ZA-53D	Output Transformer Assembly
PB-78A	Audio & Control Extender PCB Assembly
PB-73H	Extender PCB Assembly for 1” 8-channel models
ZA-54D	Spare PCB Assembly Kit

In the interest of product improvement, Otari reserves the right to change these specifications without notice or obligation.

Section 8 Printed Circuit Board Layouts and Parts Lists

The following P.C.B. pattern layout drawings and parts lists are provided for service reference. Parts list includes only main parts or the parts difficult to obtain in the field. Also the lists include the parts which should be replaced with the exact same parts supplied by OTARI to maintain performance. Many diodes, transistors, and ICs are well described in the schematics attached to the machine, so to find out the correct parts number of the needed parts, refer to the schematics.

8.1 PB-16KA REC & REPRO Amplifier P.C.B. Assembly 8-2

8.2 PB-15L Bias Control P.C.B. Assembly 8-5

8.3 PB-4PKA Reel Size Detect P.C.B. Assembly 8-6

8.4 PB-45MB Speed Calculate P.C.B. Assembly 8-7

8.5 PB-45R Hour Meter P.C.B. Assembly 8-8

8.6 PB-46A Capstan Photo Amplifier P.C.B. Assembly 8-9

8.7 PB-45SB Reel Power TR P.C.B. Assembly 8-10

8.8 PB-45T Capstan Power TR P.C.B. Assembly 8-12

8.9 PB-45VA Capstan Control P.C.B. Assembly 8-14

8.10 PB-47AB Transport Control P.C.B. Assembly 8-17

8.11 PB-4APA Master CPU P.C.B. Assembly 8-18

8.12 PB-45YA I/O Control P.C.B. Assembly 8-21

8.13 PB-45Z Tape Counter P.C.B. Assembly 8-22

8.14 PB-4HQB Reel Control P.C.B. Assembly 8-25

8.15 PB-62G Power P.C.B. Assembly 8-26

8.1 PB-16KA REC & REPRO Amplifier P.C.B. Assembly

No.	Description	Part No.	Notes	
	P.C.B.	PB9A577		
RV101	Potentiometer	RV414172	PB GAIN	10 kΩ
RV102	Potentiometer	RV423171	PB H EQ	2 kΩ
RV103	Potentiometer	RV453163	PB L EQ	5 kΩ
RV104	Potentiometer	RV415175	PB LOW EQ	100 kΩ
RV105	Potentiometer	RV414172	SEL/REP GAIN	10 kΩ
RV106	Potentiometer	RV423171	SEL/REP H EQ	2 kΩ
RV107	Potentiometer	RV453163	SEL/REP L EQ	5 kΩ
RV108	Potentiometer	RV415175	SEL/REP LOW EQ	100 kΩ
RV201	Potentiometer	RV414172	REC GAIN	10 kΩ
RV202	Potentiometer	RV414172	MONI	10kΩ
RV203	Potentiometer	RV414172	H EQ	10 kΩ
RV204	Potentiometer	RV424173	H PHASE	20 kΩ
RV205	Potentiometer	RV414172	L EQ	10 kΩ
RV206	Potentiometer	RV424173	L PHASE	20 kΩ
RV207	Potentiometer	RV452202	CMMR BAL.	500 Ω
RV301	Potentiometer	RV414172	BIAS	10 kΩ
RV401	Potentiometer	RV414207	ERASE	10 kΩ
RL503	Relay	RY1ZA013	N.R.	
RL501	Relay	RY4DC037	REC	
RL502	Relay	RY1ZA013	ERASE	
L401,L402				
L301~L303	Inductor	IN19107	270 µH	
L201,L601~L602				
L101~L103	Inductor	IN19072	3.3 mH	
	Heatsink	KZ1A028	One Transistor	
		KZ1A042	Two Transistors	
C638, C639	Capacitor	C71R012M	1 µF/35V Tantalum	
SW101	Switch	WH31016	BAL.—UNBAL.	
T101	Transformer	TF21019A	SEL/REP	
R399, R422	Resistor	R8AJ100M	1/2 W 10 Ω	
R421	Resistor	R8AJ200M	1/2 W 20 Ω	
R185, R186, R187, R188	Resistor	R8CJ180M	2 W 18 Ω	

TP1	Bias Current
TP2	Erase Current

8.2 PB-15L Bias Control P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A465A	
VR1~VR3	Potentiometer	RV414172	BIAS ADJ. 10 kΩ
VR4	Potentiometer	RV414207	ERASE ADJ. 10 kΩ
VR5	Potentiometer	RV414207	TEST SIGNAL 10 kΩ
	Jack	CN605062	TEST SIGNAL
C50	Capacitor	C71R012M	1 µF 35V Tantalum
	Heatsink	KZ1A028	
RL1	Relay	RY4DC037	MUTE
SW1	Switch	WH32003	BIAS
SW2	Switch	WH32007	LOW COMP
SW3, SW4	Switch	WH91023	EQ, CUE ATT.
R121	Resistor	R8CJ101M	2 W 100 Ω

8.3 PB-4PKA Reel Size Detect P.C.B. Assembly

No.	Description	Part No.	Notes
	Reel Size Detect PCB	PB9B599-	Bare Board
CN6	Connector, Head	CN403043	3P
CN4	Connector, Head	CN406046	6P
CN7	Connector, Head	CN407355	7P
CN2	Connector, Head	CN409049	9P
CN5	Connector, Head	CN410050	10P
	Spring	GS3010--	
D2,D4,D5,D6,D9	Diode, 1S1585LB5	PN-0199-	
D1,D3,D7,D8	indicator, TLR124	PNTLR124	Red
X1	Crystal, 9.8304 MHz	PZ4C057-	
VR2	Potentiometer, 20 k	RV424208	Fast wind speed
VR1, VR3	Potentiometer, 50 k	RV454210	
	Holder, PCB	T001026-	
SW1, SW2	Dip switch	WH31031-	

8.4 PB-45MB Speed Calculate P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A456B	Bare Board
	Connector	CN404053	Male 4P
	Connector	CN403062	Female 4P
	Female Contact	CN7B-053	
	Connector	CN406055	Male 6P
	Connector	CN403064	Female 6P
L1	Inductor	IN19069	

8.5 PB-45R Hour Meter P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A489	
	Connector	CN403056	Male 7P
	Connector	CN403065	Female Housing 7P
	Socket Contact	CN7B-052	
	Spring	GS3010	
	P.C.B. Holder	T001026	
	TM3 FC Filter	ME49001	

8.6 PB-46A Capstan Photo Amplifier P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A492A	
	Connector	CN406055	EI Type Male 6P
	Connector	CN406064	EI Type Female 6P
	Connector	CN408057	EI Type Male 8P
	Connector	CN408066	EI Type Female 8P
	Socket Contact	CN7B-052	
	Check Pin	CN901150	Orange
	Check Pin	CN901157	Black
VR101, VR102	Potentiometer	RV424220	20 kΩ Duty Balance

8.7 PB-45SB Reel Power TR P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A448	
	Connector	CN403052	Male 3P
	Connector	CN403061	Female 3P
	Socket Contact	CN7B-053	
	Connector	CN404044	Male 4P
	Connector	CN404062	Female 4P
	Socket Contact	CN7B-053	
	Connector	CN402081	Socket 2P
	Connector	CN402029	Pin Housing 2P
	Pin Contact	CN7B-041	
	Connector	CN404076	Pin 2P
	Connector	CN404033	Socket Housing 2P
	Socket Contact	CN7B-042	
D5~D12	Diode	PNG3J	
R2, R12	Resistor	R8BJ100M	1 W 10 Ω
R3, R13	Resistor	R8BJ103M	1 W 10 kΩ
R21	Resistor	R8CJ100M	2 W 10 Ω
R4, R14	Resistor	R8CJ102M	2 W 1 kΩ
R7, R8, R9, R10, R17, R18, R19, R20, R211	Resistor	R4EJR47K	10 W 0.47 Ω

Although the following parts are not installed on the P.C.B. Ass'y, they are on the same heatsink; therefore, they are described here.

D13	Diode	PN6FD13
D14	Diode	PN6FC13
Q3~Q7	Transistor	QD552BN
Q10~Q14	Transistor	QB552BN

8.8 PB-45T Capstan Power TR P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A449	
	Connector	CN403052	Male 3P
	Connector	CN403061	Female 3P
	Socket Contact	CN7B-053	
	Connector	CN403082	Socket 3P
	Connector	CN403031	Pin Housing 3P
	Pin Contact	CN7B-041	
	Connector	CN404076	Pin 4P
	Connector	CN404033	Socket Housing 4P
	Socket Contact	CN7B-042	
	Connector	CN405045	Male 5P
	Connector	CN405063	Female 5P
	Socket Contact	CN7B-053	
	Diode	PNG3J	
R2, R10	Resistor	R8BJ100M	1 W 10 Ω
R3, R11	Resistor	R8BJ103M	1 W 10 kΩ
R17	Resistor	R8CJ100M	2 W 10 Ω
R4, R12	Resistor	R8CJ102M	2 W 1 kΩ
R7,R8,R15,R16,	Resistor	R4EJR47K	10 W 0.47 Ω

Although the following parts are not installed on the P.C.B. Ass'y, they are on the same heatsink; therefore, they are described here.

Q3~Q5	Transistor	QD552BN
Q8~Q10	Transistor	QB552BN
D9	Diode	PN6FD13
D10	Diode	PN6FC13

8.9 PB-45V Capstan Control P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A459A	
VR1	Potentiometer	RV415175	100 kΩ PLAY GAIN
VR2	Potentiometer	RV424173	20 kΩ PLAY DAMP
VR3	Potentiometer	RV416178	1 MΩ GAIN
VR4	Potentiometer	RV424173	20 kΩ DAMP
VR5	Potentiometer	RV424208	20 kΩ FAST WIND SPEED
VR6	Potentiometer	RV423204	2 kΩ OFFSET NULL
	Heatsink	KZ1A028	
	Heatsink	KZ1A034	
D1	Diode	PNLN16WP	
D20~D23, D27, D28	Diode	PNTLR124	
R87	Resistor	R8AJ301M	1/2 W 300 Ω
R78, R79	Resistor	R8BJ752M	1 W 7.5 kΩ
R84	Resistor	R8CJ100M	2W 10 Ω
R85, R82, R83	Resistor	R8CJ511M	2W 510 Ω
D38, D39	Diode	PN-0170	
C64	Capacitor	C110062M	BIPOLAR ±20%
C62, C38, C16	Capacitor	C610130M	5V 100pF LOW PPM
C10,C13,C14,C17	Capacitor	C622022M	50V 22pF LOW PPM
C21	Capacitor	C71R012M	35V 1µF Tantalum

8.10 PB-47AB Transport Control P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A578B	
SW1, SW2	Switch	WH91023	Shield Operation
	Switch	WH94008	STAND-BY INHIBIT
D9~D22	Diode	PNTLR124	
RV1, RV2	Potentiometer	RV433205	3 kΩ FWD TORQUE
	Resistor Array	R94-007D	10 kΩ
	Resistor Array	R94-020D	10 kΩ

8.11 PB-4APA Master CPU P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A836A	
D10	Diode	PN-0161	
	Diode	PNTLR124	
	X Tal	PZ4C011	
VR1	Potentiometer	RV424249	20 KΩ Pitch Control Reference
SW1	Switch	WH12122	EMERGENCY
	Switch	WH91023	

8.12 PB-45YA I/O Control P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A463C	
D11, D13, D14	Diode	PNTLR124	
VR1, VR3	Potentiometer	RV414207	10 kΩ
VR6, VR7	Potentiometer	RV454210	50 kΩ
VR5	Potentiometer	RV455060	500 kΩ
VR2	Potentiometer	RV414172	10 kΩ
	Switch	WH94008	BAUD RATE
	Switch	WH32018	
	Check Pin	CN901150	Orange
	Check Pin	CN901157	Black

8.13 PB-45Z Tape Counter P.C.B. Assembly

No.	Description	Part No.	Notes
	P.C.B.	PB9A462	
C4	Capacitor	C71R012M	1 µF/35 V Tantalum
IC13	IC	I-0012	
LAMP TEST	Switch	WH31016	
	Check Pin	CN901150	Orange
	Check PIn	CN901157	Black

8.14 PB-4HQB Reel Control P.C.B. Assembly

No.	Description	Part No.	Notes
	Reel Control PCB	PB9B266-	Bare Board
D1,D2,D4~D8			
D10~D12,D14~D20	Diode, 1S1585LB5	PN-0199-	
D3, D13	Diode, ERA15-02	PN-0285-	
D9,D21~D26,D31	indicator, LN2G	PNLN2G--	
D27, D29	indicator, LN36BP	PNLN36BP	
D28, D30	indicator, LN46YP	PNLN46YP	
VR9~VR12	Potentiometer, 1 k	RV413170	
VR4, VR8	Potentiometer, 50 k	RV454174	
VR2,VR3,VR6,VR7	Potentiometer, 100 k	RV415175	
VR1, VR5	Potentiometer, 5 k	RV453163	
RL1	Relay	RY2YA053	
R81, R89, R100			
R107	Resistor, 300 Ω, 1/2 W	R8AJ301M	
R77, R96	Resistor, 7.5 k, 1 W	R8BJ752M	
R84, R103	Resistor, 10 Ω	R8CJ100M	
R82, R83, R87			
R101, R102, R106	Resistor, 510 Ω, 2 W	R8CJ511M	
R125, R126	Resistor, 1 k, 2 W	R8CJ102M	
	Panel, Reel Control	PB4HQ01-	
TP1	Preamp. Output	T.UP	
TP2	Offset	T.UP	
TP3	Input	T.UP	
TP4	Input	SUP	
TP5	Offset	SUP	
TP6	Preamp. Output	SUP	
TP7	Output	T.UP	
TP8	Output	SUP	

Section 9 Exploded Views and Parts Lists

The following exploded view drawings and parts lists are provided for service reference. Parts list titles are followed by a key number, in brackets, which refers to the corresponding exploded view drawing number. For example, the parts list for the Head Assembly [1] is keyed to the first exploded view drawing. Notice that the reference number for the Head Housing (P/N KHOF043), is related to part designation number 1 on that drawing.

When ordering parts, give a full description, using both the part number and the name of the part. If there seems to be a discrepancy between the drawings herein and your MTR-90III, contact OTARI; we assume no liability for improper servicing due to changes and improvements which we may make that subsequently render certain of these documents obsolete.

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9.1 Head Assembly: KH-6K

These key numbers which preceed the parts description refer to callouts in the exploded views. Each parts list is associated with one exploded view drawing, as indicated by the number in brackets after the parts list title.

No.	Description	Part No.	Notes
1	Housing, Head	KH0F087	for 2"
2	Screen Assembly	KH-6K-B	
3	Bracket	SR5W001	
4	Counter SW B PCB Assembly	PB-7XKAA	
	Key Top	WH0B157C	
	Switch, Self Lock	WH12017	
5	Counter SW A PCB Assembly	PB-7XKA	
	Key Top	WH0B157R	
	Switch, Non Lock	WH12122	
6	Counter LED PCB Assembly	PB-7WYA	for 2"
7	Head Housing B	KH0F088	
8	Sub Assembly, Head Base	KH-6A-D	
9	Head, 8CH Reproduce	GH1P016A	
10	Head, 8CH Record	GH1P019A	for 1" 8CH
11	Head, 8CH Erase	GH1E020A	for 1" 8CH
12	Head, 16CH Reproduce	GH6P005A	for 2" 16CH
13	Head, 16CH Record	GH6R003A	for 2" 16CH
14	Head, 16CH Erase	GH6E001B	for 2" 16CH
15	Head, 24CH Reproduce	GH6P006A	for 2" 24CH
16	Head, 24CH Record	GH6R004A	for 2" 24CH
17	Head, 24CH Erase	GH6E002B	for 2" 24CH
18	Filter Assembly	GR-1E	for 1"
19	Filter Assembly	GR-6J	for 2"
20	Guide Roller Assembly	GR-1N	for 1"
21	Guide Roller Assembly	GR-61A	for 2"
22	Bracket, Head Connector	KH6B003	
23	Bracket., Head Wire Cramp	KH6A002	
24	Handle, Connector	CN7B-138	
25	Connector	CN250369	
26	Connector	CN250368	
27	Connector, Socket Contact	CN7B-366	
28	Connector, Pin Contact	CN7B-364	
* 29	Stud	KZ9I370A	for 1"
* 30	Shield, Head	KH6B004	for 1"
31	Side End L	T007403	
32	Side End R	T007404	
33	Plate, Tape	T007401	

No. 29 and No. 30 are used in only early machine and No.1 and No. 6 are used instead in later machine.

9.2 Capstan/CNT Roller Assembly: KC-6E/KI-6E

No.	Description	Part No.	Notes
1	Capstan Assembly	KC-6E-A	
2	Capstan Photo PCB Assembly	PB-46A	
3	Bracket, PCB	PB46A01	
4	Stud	KZ7B811	
5	Stud	KZ7B810	
6	Cap, Capstan	KC0B020	
7	Roller Sub Assembly	KI-6E-A	
8	Retaining Ring, C Type	F7028.0	
9	Bearing	BA1Z011W	
10	Collar, Bearing	KZ7C042	
11	Washer, Wave	F7820.0	
12	Collar, Outer	KZ7C043	
13	Holder, Roller Shaft	KI6A003	
14	Holder, Counter Board	KI6A005	
15	Board, Counter	KI6A004	
16	Counter PhotoPCB Assembly	PB-74D	
17	Washer, Nylon	KZ6C006	
18	(not assigned)		
19	(not assigned)		
20	Sensor Assembly	SR-1R	

9.3 Tape Lifter/Shield Assembly: KR-6B/ZA-72S

No.	Description	Part No.	Notes
1	Bracket, Solenoid	KR6B009	
2	Solenoid	GP1B06	
3	Pin, Solenoid	KZ5A003	
4	Bar, Connector	KR6B006	
5	Stopper, A	KR6B007	
6	Stopper, B	KR6B010	
7	Stopper, Rubber	KR6B011	
8	Angle, Dumper Actuate	KR6B005	
9	Air Pot, AD-2" T x H-3	AS5048	
10	Holder, Dumper	KR6B008	
11	Link, Sub Assembly A, Lifter	KR6B001	for 2"
12	Link, Sub Assembly B, Lifter	KR6B002	for 2"
13	Pin, Lifter	KR6A009	
14	(not assigned)		
15	Spring	GS1090	
16	Collar, Screw	KA6A021	
17	Plate, Elevate Shielding	ZA72B03	
18	(not assigned)		
19	Plate, Photo Interrupt Actuator	ZA72S09	
20	Block, Shield Guide	ZA72B01	
21	Nut, Lead	ZA72B08	
22	Plate, Nut Holding	ZA72B05	
23	Shaft, Guide	ZA72S07	
24	Screw, Lead	ZA72B07	
25	(not assigned)		
26	(not assigned)		
27	Coupling	PZ1A037	
28	(not assigned)		
29	P.C.B. Ass'y, Motor	PB-74F	
30	P.C.B., Photo Interrupter	PB-78F	
31	Retaining Ring, E Type	F74TE24	
32	Retaining Ring, E Type	F74TE09	
33	Diode, SM1-02	PNSM1-02	
* 34	Link, Sub Ass'y A, Lifter	KR1B001	For 1"
* 35	Link, Sub Ass'y B, Lifter	KR1B002	For 1"
36	Bar, A Connection	KZ3A156	
37	Bar, B Connection	KZ3A155	
38	P.C.B., A Photo Interrupter	PB-78F	
39	Shielding Base	ZA72S08	

*No. 34 and No. 35 are used in only early machine and No. 11 and No. 12 are used instead in later machine.

9.4 Tension Arm Assembly: KA-6H

No.	Description	Part No.	Notes
1	Protector, Tension Roller	T004407	for 2"
2	Damper	T004408	
3	Roller Assembly, Tension	GR-6H	
4	Tension Arm	KA6A039	
5	Bar C, Connection	KA6B001	
6	Screw, Adjusting	KZ6A003	
7	Nuts, M3	F517-3	
8	Screw, Joint	KA6A034	
9	Collar, Nut	KA6B003	
10	Stopper, A	KR6B007	
11	Spring, Tension	GS1184	for 2"
12	Shaft, Spring Hooking	KA6A031	
13	Retaining Ring, E Type	F74TE19	
14	Bearing	BA11260L	
15	Link, Tension	KA6A026	
16	Shaft, Tension Link	KA6A027	
17	Stopper, Rubber	KR6B011	
18	Stopper, B	KR6B010	
19	Bearing	BA12280W	
20	Holder, Tension Shaft	KA6A006	
21	Stopper, Bearing	KA6A009	
22	Angle, Stopper	KA6E008	
23	Bracket, Potensiometer	KA6E007	
24	Spring	GS2133	
25	Angle	KA6F001	
26	TEN. SENS. PCB Assembly	PB-73VB	
27	Air Pot Ass'y, L	AS-73D	
28	Air Pot Ass'y, R	AS-73E	
29	Solenoid	GP1K01	
30	(not assigned)		
31	Plate B, Solenoid Link	KA6A023	
32	Spring Pin, Wave	F62308	
33	Collar, Screw	KA6A021	
34	Diode	PN-0285	
35	Bracket A, Solenoid	KA6B012	
36	Bracket, Connector	KA6C006	
37	Connector	CN402029	
38	Connector, Pin	CN7B-041	
39	Connector, Socket	CN7B-042	
40	Connector	CN402030	
41	(not assigned		
42	(not assigned)		
43	Roller Assembly, Tension	GR-1D	for 1"
44	Spring, Tension	GS1092	for 1"
45	Arm Shaft	KA0A054	
46	Blind	KA6H001	
47	Plate, Tape	T007401	
48	Boss	KA0E019	

9.5 Reel Assembly: KW-6B

No.	Description	Part No.	Notes
1	Reel Table Assembly	KW0HG	for 2"
2	Pin, Reel Drive	KW0E042	
3	Guard Ring, Reel Turntable	KW0H043	
4	Motor Assembly, Reel	MR5A030S	
5	Plate, Brake Base	KW-6E-B	
6	Felt, Brake	KW6B002	Ass'y
7	Band, Brake	KW6B003	(KW-6B-A)
8	Stud	KZ9H140B	
9	Plate, Brake Guide	KW-1G-A	
10	Collar	KW6B010	
11	Drum, Reel	KW0A056	
12	Solenoid	GP1B02	
13	Screw, Brake	KZ6A063	
14	Stopper	KZ2A015	
15	Pin, Solenoid	KZ5A003	
16	Retaining Ring, E Type	F74TE09	
17	Angle, Band Holding	KW6B004	
18	Bracket, Brake Linkage	KW6B014	
19	(not assigned)		
20	(not assigned)		
21	Pin, Spring Hooking	KZ5B005	
22	Spring, A	GS1088	
23	Spring, B	GS1089	
24	(not assigned)		
25	Angle, Brake Adjustment	KW6B006	
26	(not assigned)		
27	Connector	CN404034	
28	Connector	CN404033	
29	Connector, Pin	CN7B-041	
30	Connector, Socket	CN7B-042	
31	Nuts, M4	F517-4	
32	Retaining Ring, E Type	F74TE18	
33	Diode	PNSM1-02	
34	Reel Table Ass'y	KW0HK	for 1"
35	Safety Photo PCA	PB-7BTC	
36	Plate, Slit	SR3Z024B	
37	Cover, Slit	KW1G002	
38	Connector	CN403390	
39	Connector, Socket	CN7B-263	
40	Cushion	PZ1C089	
41	Screw, Adjustment	KZ6A099	

9.6 Motor Drive Heatsink Assembly: ZA-94Y

No.	Description	Part No.	Notes
1	Panel, Rear	ZA94Y01	
2	Heatsink	ZA93J02	
3	Panel, Side	ZA92F02	
4	Edging	PZ1G076	
5	Handle	CY1020	
6	Fan, Cooling	AS1021	
7	Guard, Fan	AS5010	
8	Stud	KZ9J405A	
9	Angle, A	ZA92F04	
10	Angle, B	ZA92F05	
11	Hinge, R	CY2019	
12	Hinge, L	CY2020	
13	Stopper, B	ZA92F07	
14	Stopper, A	ZA92F03	
15	Transistor	QB552BN	
16	Transistor	QD552BN	
17	Sheet, Transistor Insulation	PZ4B053	
18	Connector	CN603060	
19	P.C.B. Ass'y, Reel Power Transistor	PB-45S	
20	(not assigned)		
21	Stud	KZ9A110B	
22	Collar	ZA92F06	
23	Collar, Panel	ZA91F08	
24	Washer, Dress	F540-4BN	
25	Washer, Nylon	KZ6C006	
26	Transistor	QD970K	
27	Transistor	QB791K	
28	Diode	PN6FC13	
29	Diode	PN6FD13	
30	P.C.B., Transistor Relay	PB9A385A	
31	Sheet, Transistor Insulation	PZ4B054	
32	Plate, Nut	A104412	
33	Disc, Shield	DS1Z026	
34	Cover, Shield	DS1Z027	

9.7 Amp Chassis Assembly:

No.	Description	Part No.	Notes
1	Cover, Amp Chassis	CB30902	
2	Panel, Amp L Side	K104602	
3	Panel, Amp R Side	K104601	
4	Angle, Amp Rack	K104607	
5	Angle A, Amp Guide Rail	K104605	
6	Angle B, Amp Guide Rail	K104606	
7	P.C.B. Assembly, Record/Reproduce	PB-16KA	
8	Panel, Amp Chassis Reinforcement	K104608	
9	Guide, P.C. Board	CN7B-045	
10	Angle A, Connector	K104603	
11	Angle B, Connector	K104604	
12	Connector	CN3A0086	
13	P.C.B., Amp Mother	PB9A458	
14	Clamper, Head Wire	A103702	
15	Flange, Chassis	K104510	
16	Plate, Shielding	ZA-91N	
17	P.C.B. Ass'y, Record/Reproduce	PB9A577	PB-16KA
18	Panel, Amp P.C. Board	PB16K01	
19	Card Puller	PZ4E007	
20	Connector	CN350176	
21	Connector	CN330221	
22	Connector	CN412079	
23	Connector	CN412039	
24	Connector	CN410050	
25	Connector	CN402213	
26	Connector	CN404044	
27	Connector	CN403043	
28	Connector	CN404062	
29	Connector	CN403061	
30	Connector, Socket Contact	CN7B-042	
31	Switch	WH31016	
32	Connector	CN408048	

9.8 Control Panel Assembly/24CH VU meter Assembly: CB-24J/ZA-94Z

No.	Description	Part No.	Notes
1	Knob	KN1112	for 2"
2	Block, Splicing	T902207	
3	Stopper, Blade	T004411	
4	Escutcheon, Switch	KN5013	
5	Switch	WH11287	
	Lamp	LU2077	
	Key Top	KN2158	
6	Switch	WH11287	
	Lamp	LU2077	
	Key Top	KN2156	
7	Switch	WH11287	
	Lamp	LU2077	
	Key Top	KN2157	
8	Switch	WH11287	
	Lamp	LU2077	
	Key Top	KN2159	
9	Switch	WH11287	
	Lamp	LU2077	
	Key Top		
10	Switch	WH11287	
	Lamp	LU2077	
	Key Top	WH0B128Y	
11	Cap, Switch	KN2075	
	Switch	WH11018	
	Cover, Protect	WH0A023	
	Lamp, 28V	LU2007	
12	Guard, Switch	CB24205	
13	Spacer	KZ1A086	
14	Panel, Control	CB24J01	
15	Angle	CB24J05	
16	Bracket A, Switch	CB24J03	
17	Bracket B, Switch	CB24J04	
18	CUE LED PCB Assembly	PB-7XDA	
19	Encorder, Rotary	SR3Z047	
20	Holder, Cue Encorder	CB24J06	
21	Stay, Right	CY2019	
22	Stay, Left	CY2020	
23	Holder	ZA94Z04	
24	Holder	ZA94Z05	
25	Screen	ZA94Z02	
26	Sheet, VU Meter	ZA94Z01	
27	VU Meter	ME11023	
28	LED PCB Assembly	PB-7LMB	
29	Panel Assembly, VU Meter	ZA-94ZA	
30	VU Meter PCB Assembly	PB-1DDA	
31	Collar	ZA91F08	
32	Panel, Top	T007405	
33	Stopper, Hinge	K106009	
34	Blind, Rear	K106007	
35	Panel, Skin	T007406	
36	Washer	KZ6C011	
37	Rosette	F540-4BN	
38	Bracket, Connector	T007407	
39	Connector	CN250403	
40	Connector	CN7B-176	
41	Bracket, MR-R	CN7B-061	
42	Plate, Name	PT1010	

9.9 Control Chassis Assembly: CB-319

No.	Description	Part No.	Notes
1	REEL CONTROL PCB Assembly	PB-4HQB	
2	CAPSTAN CONTROL PCB Assembly	PB-45VA	
3	TRANSPORT CONT. PCB Assembly	PB-47AB	
4	MASTER CPU PCB Assemblyy	PB-4APA-	
5	I/O CONTROL PCB Assembly	PB-45YA	
6	TAPE COUNTER PCB Assembly	PB-45Z	
7	BIAS CONTROL PCB Assembly	PB-15L	
8	Angle A, Control Chassis	K104708	
9	Angle B, Control Chassis	K106102	
10	Angle, Amp Rack	K104707	
11	Guide, PCB	CN7B-045	
12	Panel, Control Chassis L Side	K104702	
13	Panel, Control Chassis R Side	K104701	
14	Flange, Chassis	K104510	
15	Cover, Control Chassis	CB30902	
16	Angle B, Connector	K104704	
17	Angle B, Connector	K106101	
18	Connector	CN3A0086	
19	P.C.B., Control Mother	PB-7DDC	
20	Connector	CN415080	
21	Connector	CN415041	
22	Connector, Pin Contact	CN7B-042	
23	Socket, Relay	RY0077	
24	Relay	RY2DC106	
25	Connector	CN320219	
26	Connector	CN326220	
27	Connector	CN330221	
28	Connector	CN340223	
29	Connector	CN350176	
30	Connector	CN403043	
31	Connector	CN404044	
32	Connector	CN406046	
33	Connector	CN407047	
34	Connector	CN408048	
35	Connector	CN409049	
36	Connector	CN410050	
37	Connector	CN412051	
38	Connector	CN403061	
39	Connector	CN404062	
40	Connector	CN406064	
41	Connector	CN407065	
42	Connector	CN408066	
43	Connector	CN409067	
44	Connector	CN410068	
45	Connector	CN412069	
46	Connector, Contact	CN7B-281	
47	Cable Assembly	ZA6TN0A	
48	Cable Assembly	ZA6TM0A	
49	Cable Assembly	ZA6TL0A	
50	Cable Assembly	ZA6TJ0A	
51	Cable Assembly	ZA6TK0A	
52	Key, Mis-Insertion Prevention	K106103	

9.10 24CH Input/Output Assembly: ZA-95A

No.	Description	Part No.	Notes
1	Panel, Amp Chassis Rear Panel	ZA95A01	
2	Panel, Output Transformer	ZA92H02	
3	Wire Assembly, Amp Control	ZA-63A	
4	Connector, XLR	CN103046	
5	Connector, XLR	CN103045	
6	Hinge, R	CY2019	
7	Hinge, L	CY2020	
8	Collar, Panel	ZA91F08	
9	Output Transformer Assembly	ZA-53D	Option
10	Angle, Input Trans P.C.B. Assembly	ZA91G02	Option
11	P.C.B. Assembly, Input Transformer	PB-77Z	Option
12	P.C.B., Input Transformer	PB9A501	(ZA-53C)
13	Transformer, Input	TF21006	
14	Connector	CN403043	Option
15	Washer, Dress	F540-4BN	
16	Washer, Nylon	KZ6C006	
17	Plate, Nut	A104412	

9.11 Power Supply Assembly: DS-4W

9.11.1 Power Supply Assembly [1]

No.	Description	Part No.	Notes
1	Cover, Power Supplies	DS1Z025	
2	Frame, Heatsink	DS1Z022	
3	Heatsink B	ZA91P01	
4	Rectifier	PN-0005	
5	Heatsink A	ZA92N01	
6	Transistor	QD552BN	
7	Transistor	QB552BN	
8	Regulator	I-0E001	
9	Regulator	I-0E002	
10	Sheet, Transistor Insulation	PZ4B053	
11	Connector	CN603060	
12	Stud	KZ9A110B	
13	P.C.B. Assembly, Power Supplies	PB-62E	
14	P.C.B. Assembly, Power Supplies	PB-62F	
15	Panel, Side	DS1Z023	
16	Bracket, Cooling Fan	DS1Z003	
17	Fan	AS1021	
18	Cover, Trans Shielding	DS1Z015	
19	Plate, Trans Shielding	DS1Z016	
20	Transformer, Power Supplies	TF11065	
21	Rectifier	PN-0203	
22	Cover, Shield	DS1Z027	

9.11.2 Power Supply Assembly [2]

No.	Description	Part No.	Notes
1	Panel, Power Supplies	DS1Z008	
2	Chassis, Power Supplies	DS1Z001	
3	Panel Connector	DS1Z006	
4	Angle B, Panel Mount	DS1Z011	
5	Angle A, Panel Mount	DS1Z012	
6	Angle, Capacitor	DS1Z005	
7	Handle	CY1014	
8	Circuit Breaker	WH92024	
9	Angle, Breaker Mount	WH0A024	
10	L.E.D.	LU4015	
11	P.C.B. Assembly, L.E.D.	PB-77PAA	
12	Plate, P.C.B. Holding	DS1U022	
13	Resistor	R5DKR10C	
14	Resistor	R5DKR22C	
15	Capacitor	C122204M	
16	Capacitor	C133348M	
17	Capacitor	C133349M	
18	Capacitor	C133350M	
19	Relay	RY2DA079	
20	Transient Surge Absorber	PN-0142	
21	Stud	KZ91D14A	
22	Plate B, Insulation	DS1U027	
23	Bus Bar A	DS1U024	
24	Bus Bar Common	DS1U023	
25	Bus Bar B	DS1U025	
26	Plate A, Insulation	DS1U026	
27	Sheet A, Insulation	DS1Z014	
28	Sheet B, Insulation	DS1Z021	
29	Mount Plate, P.C.B.	DS1Z007	
30	Stud	KZ9A110B	
31	P.C.B. Assembly, Resistor	PB9A361	
32	P.C.B. Assembly, Regulator	PB-62G	
33	Guide, P.C. Board	CN7B-020	
34	Connector	CN344007	
35	Holder, Fuse 16	FH1-021	
36	Fuse	FH7A100	
37	Connector	CN402029	
38	Connector	CN402030	
39	Connector	CN403031	
40	Connector	CN403032	
41	Connector	CN406035	
42	Connector	CN406036	
43	Connector	CN406218	
44	Connector	CN406195	
45	Connector	CN412039	
46	Connector	CN412040	
47	Connector	CN415041	
48	Connector	CN415042	
49	(not assigned)		
50	Circuit Breaker	WH91028	
51	Circuit Breaker	WH10933	
52	Circuit Breaker	WH91035	
53	Circuit Breaker	WH91039	
54	Circuit Breaker	WH91038	
55	Circuit Breaker	WH91040	
56	Washer, Dress	F540-4BN	
57	Washer, Nylon	KZ6C006	
58	Lug Terminal	CN7D-004	
59	Bracket, Power Connector	DS4W002	
60	Connector	CN103013	
61	Angle, Connector	DS1U021	

9.12 Case Assembly: K1176

No.	Description	Part No.	Notes
1	Frame, Case	K106014	
2	Panel L, Case Side	K117610	
3	Panel R, Case Side	K117611	
4	Panel, Power Supplies Rear	K117612	
5	Handle	CY1021	
6	Stay Arm, L	CY2024	
7	Stay Arm, R	CY2025	
8	Door, L	K1176-A	
9	Door, R	K1176-B	
10	Cushion, Door	K106012	
11	Bar A, Door Hinge	K106010	
12	Bar B, Door Hinge	K106011	
13	Rubber, Door Escutcheon	CY5003	
14	Ball Catch	CY3016	
15	Nut, Plate	K104508	
16	Bracket, Catch Base	K104507	
17	Hinge B, Door	K1045-B	
18	Hinge A, Door	K1045-A	
19	————————	———	
20	Protector, Wire	K106013	
21	Shaft, Hinge	K106008	
22	Caster	CY4065	With Stopper
23	Caster	CY4064	
24	Flange, Chassis	K104510	
25	Finger Guard	AS5010	
26	Rosette	F540-4BN	
27	Washer, Nylon	KZ6C006	
28	Disc, Shield	DS1Z026	
29	Plate, Shield	DS1Z024	
30	EXT Connector Relay PCB Assembly	PB-7WZA	
31	Panel, Blank	K117613	

9.13 Remote Control Assembly: CB-147-S

No.	Description	Part No.	Notes
1	Panel, Front	CB24K01	
2	Escutcheon, Front	CB14701	
3	Cover, Acryl	CB24403	
4	Bracket, Angle	CB24501	
5	P.C.B. Assembly, indicator	PB-77N	
6	Angle, P.C.B. Mount	KZ3A104	
7	P.C.B. Assembly, Deck Switch	PB-77L	
8	P.C.B. Assembly	PB-77O	
9	P.C.B. Assembly, Timer	PB-46F	
10	Switch	WH41035	
11	Cap, Switch	WH0B011C	
12	Stud	KZ7A842	
13	Switch	WH12124	
14	Cap, Fast	KN2042	
15	Cap, Stop	KN2040	
16	Cap, Play	KN2041	
17	Cap, Rec	KN2043	
18	Cap, Cue	KN2045	
19	Lamp	LU2007	
20	Protector, B, Switch	CB10414	
21	P.C.B. Amp Switch	PB9A450	
22	Angle, P.C.B.	PB46B01	
23	Switch	WH41023R	
24	Switch	WH42024W	
25	indicator	PNTLR124	
26	indicator	PNTLY124	
27	indicator	PNTLG124	
28	indicator	PNTLO124	
29	Stud, C	KZ7A166	
30	Switch	WH12108	
31	Knob	KN1060	
32	Connector	CN328038	
33	P.C.B Assembly, Control	PB-46C	
34	Case	K117701	
35	Cover, Case	K117702	
36	Cable Assembly, A	ZA-63F	
37	Cable Assembly, B	ZA-63G	
38	Cable Assembly, D	ZA-63I	
39	Screw	CN7B-189	
40	Cushion	PZ1C058	
41	Stand, L	ZA72H02	
42	Stand, S	ZA72H01	
43	Shaft, Holder	ZA72H06	
44	Block, Cylinder	ZA72H07	
45	Shaft, Clamping	ZA72H05	
46	Screw, Clamping	ZA72H03	
47	Knob	ZA72H04	
48	Stud	KZ9H170C	
49	Stud	KZ9A075B	
50	Washer	KZ6C037	

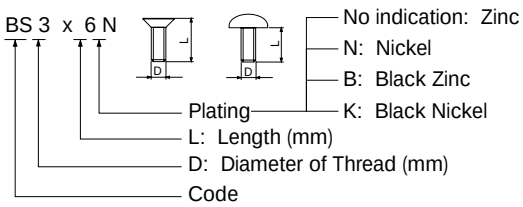
9.14 Auto Locator Assembly:CB-148-S

No.	Description	Part No.	Notes
1	Panel, Front	CB14801	
2	Escutcheon, Front	CB14701	
3	Protector, B, Switch	CB10414	
4	Cap, Rec	KN2043	
5	Cap, Play	KN2041	
6	Cap, Stop	KN2040	
7	Cap, FF, Rew	KN2042	
8	Cap, Zero Set	KN2047	
9	Cap, Search Zero	KN2051	
10	Cap, Search	KN2048	
11	Cap, Shuttle	KN2049	
12	Cap, Auto Rewind	KN2050	
13	Switch	WH12124	
14	Lamp	LU2007	
15	Bracket, Switch	CB11507	
16	Connector	CN306187	
17	P.C.B., Switch	PB9A476	
18	Stud	KZ9H390C	
19	P.C.B. Assembly, Switch	PB-77W	
20	Cover, A, Acryl	CB11505	
21	Cover, B, Acryl	CB11506	
22	Stud	KZ9H170C	
23	Stud	KZ9H070A	
24	P.C.B. Assembly, indicator	PB-77U	
25	Cable Assembly, 20P	PZ9D053	
26	Cable Assembly, 40P	PZ9D052	
27	P.C.B. Assembly, I/O	PB-46D	
28	Case	CB14802	
29	Bracket, Connector	CB14803	
30	Switch	WH32009	
31	Connector	CN250368	
32	Connector, Pin Contact	CN7B-120	
33	Screw, Connector	CN7B-189	
34	Washer	KZ 6C006	On Old Version

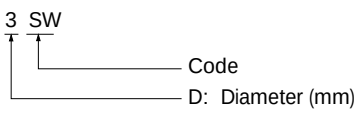
Hardware

Name	Code	Name	Code
Bind SEMS Screw	BS	Hex Head Bolt	H
Pan SEMS Screw	PS	Hex Nut	N
Triple Screw	TS	Flat Washer	W
Binding Head Screw	B	Fiber Washer	FW
Pan Head Screw	P	Stainless Steel Washer	SSW
Flat Countersunk Head Screw	F	Spring Washer	SW
Oval Countersunk Head Screw	O	Lock Washer	LW
Truss Head Screw	T	Knob Washer	KW
Pan Screw with Spring Washer and Flat Washer	PZ	Retaining Ring, E-type	E
Hex Socket Head Screw	C	Retaining Ring, C-type, Outer	CO
Hex Socket Headless Set Screw, Flat	S	Retaining Ring, C-type, Inner	CI
Hex Socket Headless Set Screw, Pinpoint	SP	Spring Pin	SPN
Button Head Socket Cap Screw	BC		
Flat Head Socket Cap Screw	FC		
Tapping Pan Head Screw	TP		
Tapping Flat Countersunk Head Screw	TF		
Flat Head Wood Screw	FWS		

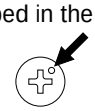
Example 1: Screw



Example 2: Washer



All screws conform to ISO standard, and have a cross-recessed head, unless otherwise noted. ISO screws have a point inscribed in the head.



Appendix A

An external clock (reference oscillator) can be used to control the speed of the MTR-90III capstan motor. When the SPEED MODE switch is set to the EXT position (see **§ 3.2**), a suitable input signal must be applied to P/N18 of the EXT CLOCK input connector (25 pin Honda connector on the MTR-90III rear panel) or P/N20 of the PARALLEL I/O connector. The reference frequency is 9,600 Hz, and should be at TTL level (0 V low, +5V high), approximately a 50% duty cycle; a sine wave source may be used at a level of about 10 Vp-p.

When the external reference is in use, the HIGH/LOW SPEED SELECT switch still operates although tape speeds (15/30 ips or 7.5/15 ips) vary proportional to the deviations of the clock input from the reference frequency.

When using SMPTE time code synchronizers, the SMPTE-CUE slide switch (on the back of the upper card cage mother board near the #24 card connector) should be turned on to activate Lifter Defeat. If the MTR-90III is being used for 16 track operation, a jumper cable will have to be installed to join the 3-pin Molex connector adjacent to this switch to a similar connector on the same circuit board located between the #16 and #17 card connectors (#8 and #9 for 8 track operation).

Detailed information on using time code synchronizers with the MTR-90III is available from the manufacturer of the equipment or by contacting OTARI.

CAUTION! Do not feed two 9.6 kHz signals from both the EXT CLOCK and PARALLEL I/O connectors at the same time. If two different signals are recieved from the EXT CLOCK and the Parallel I/O at the same time, the MTR-90III may malfunction.

SMPTE Location Control and Synchronization A-2

Adams-Smith 2600 SMPTE Synchronizers A-4

BTX Shadow Synchronizer A-6

Audio Kinetic Q-Lock Mod. 2.10 Synchronizer A-7

EECO MQS 100 Synchronizer A-8

SMPTE Location Control and Synchronization

SMPTE is an acronym for the Society of Motion Picture and Television Engineers. SMPTE time code is a standard digital coding technique for identifying the location of an audio or video tape; coding is done in hours, minutes, seconds and frames (24 frames/second for film or 30 frames/second for video). A time code generator is used to record the code onto one track of the tape. A time code controller or locator can then read the code from two or more tape machines, and, by also servo controlling the reel motors of those machines, bring them to specific cue points. A time code synchronizer further controls the capstan motors to keep both of the machines running synchronously. These techniques can be used to obtain more tracks of recording, to mix audio in sync with video or film images, to make complex edits per user-selected programs, etc.

Contact Otari or local Otari dealers for the connectors necessary for the connection (Otari part number CN225221 for EXT CLOCK or Otari part number CN237323 for Parallel I/O).

The following are some of the synchronizers now available for use with the MTR-90II. For further details on newly developed synchronizers and interfaces, you can contact the manufacturer, Otari or local Otari dealers.

Manufacturers	Type of Synchronizers	Interface Information
ADAMS-SMITH	WIDE BAND or TACH	Page **A-4**
BTX	TACH/SMPTE	Page **A-6**
AUDIO KINETICS	TACH	Page **A-7**
EECO	WIDEBAND	Page **A-8**
CONVERGENCE	TACH/SMPTE	Not shown

SUGGESTIONS REGARDING INTERFACE OF THE MTR-90II TO A SMPTE BASED SYNCHRONIZER OR CONSOLE AUTOMATION SYSTEM.

The following Steps should be performed whenever the MTR-90III is to be interfaced with a SMPTE based system:

1. Turn on SW1-4 on the MTR-90 TRANSPORT CONTROL PCB Assembly.
RESULT: This allows the machine to output SMPTE code to the synchronizer before the transport has reached operating speed.

2. Adjust the Tape Lifter Airpot so that the tape contacts the heads within 0.5–1.5 seconds when coming from fast wind to a Stop. (Refer to §5.8 on page 5-10 #5).
RESULT: This allows the machine to output SMPTE code to the synchronizer immediately upon entering Play from Fast Wind.

3a. It may be necessary to turn on SW1-1 on the TRANSPORT CONTROL PCB Assembly when using any wideband reader and most tach pulse/SMPTE readers.
RESULT: This allows the audio signal to not be attenuated when the tape lifters are defeated in fast wind. This lifter defeat is commonly used by synchronizer manufacturers at 2 times play speed to recalculate the SMPTE to tach pulse rate.

3b. Turn on SW4 on the BIAS CONTROL PCB Assembly.
RESULT: This bypasses the audio attenuation system, including the attenuation of the audio while in fast wind even without the lifters defeated.

NOTE: Refer to §2.2 on Pages 2-2, 3 and 4 for further information regarding the location, function and settings of the switches above.

4. When a wideband reader synchronizer is used, it is necessary for the MTR-90 to reproduce the complex waveforms of the SMPTE code at 10 or 20 times normal play speed. To enable the MTR-90II to reproduce time code accurately at these speeds one of the following changes must be made:

   A. The WBR-1S is a piggyback PCB attached to an audio channel PCB. This modification must be done by Otari, and is available installed on either a new or your existing audio PCB. The WBR-1S can also serve as a normal Audio channel PCB (switchable) if so ordered. The WBR-1S also includes two logic bypasses that permit it to be free of the mute and attenuation requirements discussed in Steps 1 through 3 above. The WBR-1S features an adjustable phase trimmer to optimize the performance of the board for the head and speed being used.

   B. Due to technical advances in SMPTE time code readers since 1982, it is possible to modify a standard Audio PCB to be a dedicated SMPTE code channel PCB, instead of adding a WBR-1S.

      1. Install 10 kΩ resistors across both R101 and R125 on the Audio PCB.

      2. Cut the traces leading to pin 12 on the "B" side, and to pin 34 on the "A" side of the PCB edge connector.

      3. Add a wire jumper from Pin 3 of IC 105 (+ voltage) to the end of R589 that went to the edge connector.

5. When constructing interface cables for use with the MTR-90II, care must be taken to prevent crosstalk between the 9600 Hz signals used for capstan speed reference. The 9600 Hz signal is sent from the MTR-90II to the synchronizer to enable the synchronizer to loop the capstan control signal back to the tape machine when the synchronize is put into bypass.

The MTR-90II is equipped with an automatic reference switching circuit that, when the tape machine is in External Reference mode, looks for a 3.5 to 5 Volt TTL FM signal with a range of 25% to 250% of 9600 Hz. If a signal meeting both these parameters is not present, the MTR-90II will automatically be switched to 100% crystal reference.

If there are any questions regarding these suggestions for preparing your MTR-90II for SMPTE interface, contact your local Otari dealer, representative, or Otari technical support.

The following information regarding interface of the MTR-90II to various synchronizers has been provided by the synchronizer manufacturers.

Adams-Smith 2600 SMPTE Synchronizers

Figure A-1 illustrates the necessary cables for interfacing the Adams-Smith Model 2600Y Tape Synchronizer with the MTR-90III EXT CLOCK or Parallel I/O connector.

The following notes apply to **Figure A-1**.

1. Typical Form C relay contact.
2. Typical transistor switch output.
3. This connector optional when Slave LTC Reader is used; otherwise not required.
4. This connector not required when Slave LTC Reader is used.
5. This connector not required when Master LTC Reader is used.
6. O VDC indicates Reverse.
7. 40 pulses/second at 15 ips
8. Either relay or transistor switching may be used for Stop, F.Fwd, Rew, and Play commands and Lifter Defeat function.
9. Use relay switching only for Capstan switch over. (Synchronizer bypass).
10. Set FM frequency to 9600 Hz.

Suggested Constants for use witht he MTR-90III:

Constant	Value	Function
01	65	FM Freq. Set
02	03	Lock Servo
03	23	FM Freq. Set
04	08	FM Freq. Set
10	12	Cueing/Parking
31	28	Tach Rate

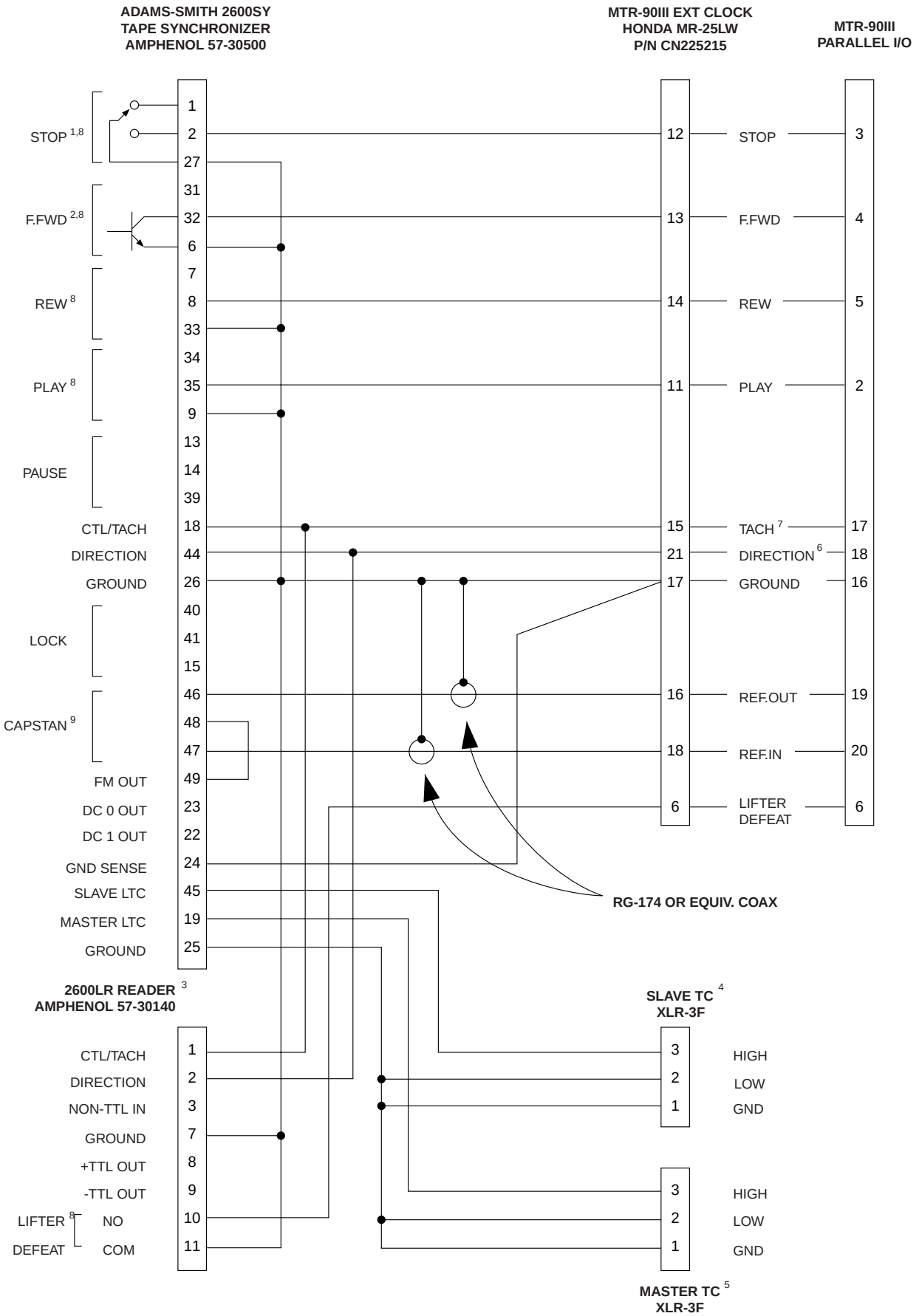


Figure A-1
Adams-Smith 2600 SMPTE Synchronizer Connection

BTX Shadow Synchronizer

Figure A-2 illustrates the necessary cable for connecting the BTX Shadow Synchronizer with to the MTR-90III. The Capstan Speed Control Range of the Shadow must be adjusted for a range of 50% to 200% of normal play speed. Use the "speed %" display on the CB-147 Remote Control Unit to assist in this adjustment. Refer to the BTX Shadow Synchronizer operation manual for further details.

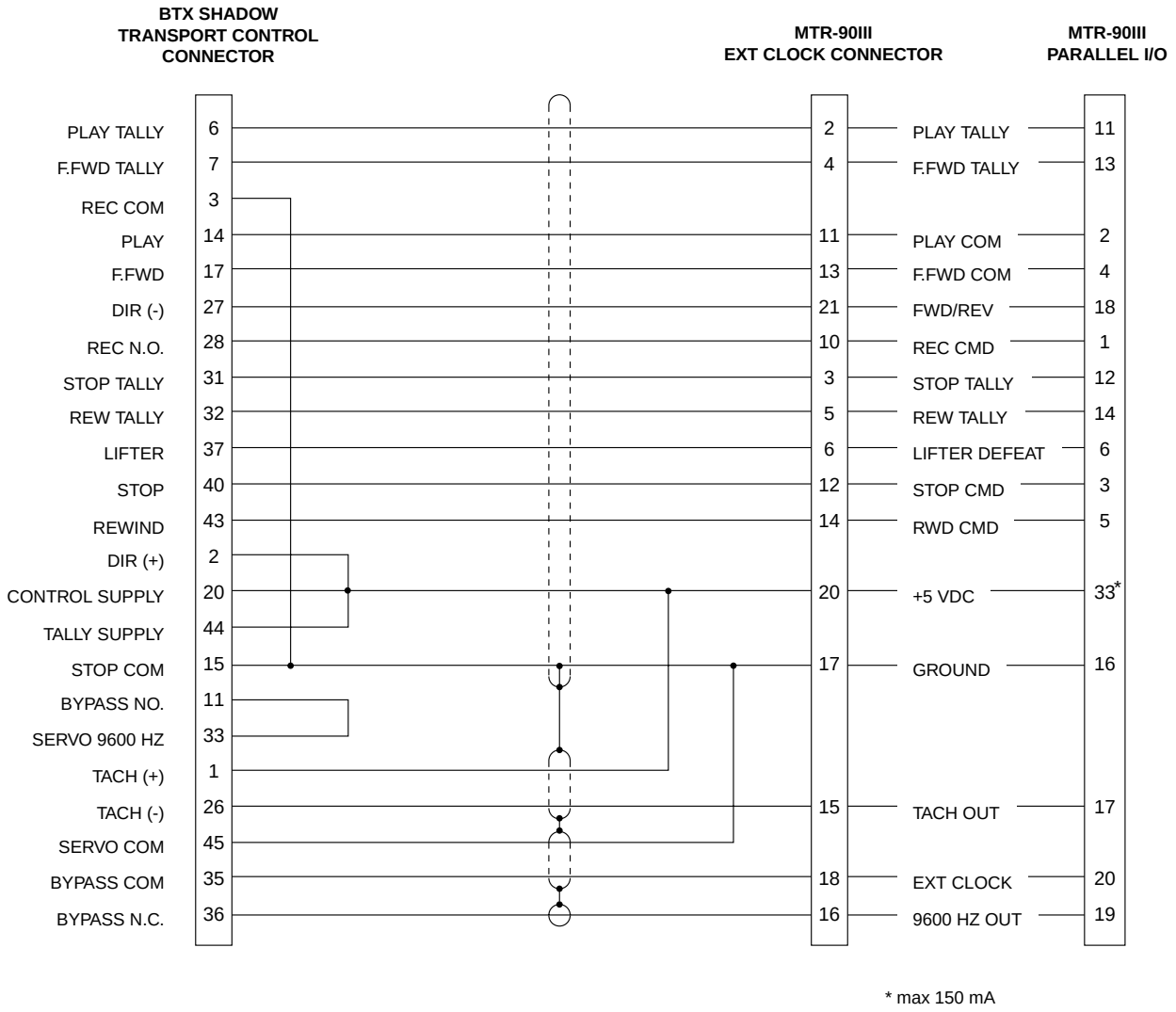


Figure A-2
BTX Shadow Synchronizer Connection

Audio Kinetic Q-Lock Mod. 2.10 Synchronizer

Figure A-3 describes the necessary cable to interface the MTR-90III to the Audio Kinetic Q-Lock Synchronizer.

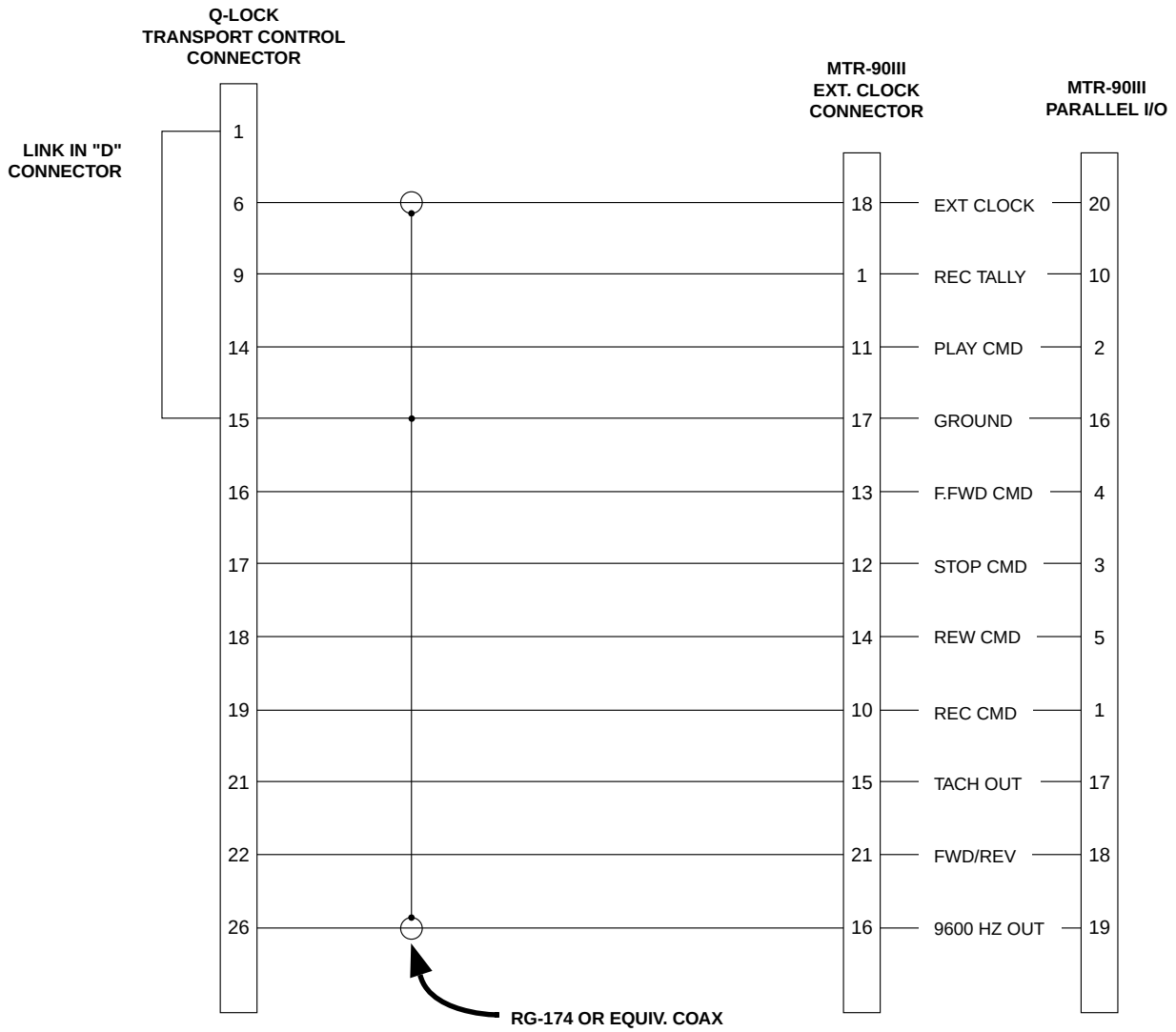


Figure A-3
Q-LOCK Mod. 2.10 Synchronizer Connection

EECO MQS 100 Synchronizer

The EECO MQS 100 is an SMPTE code base system, and as such requires the machine to reproduce SMPTE time code at fast wind speeds (approximately 420 ips). This wide bandwidth reproduction is achieved through the use of the Otari accesory WBR-1S. The WBR-1S is a piggyback PCB Assembly attached to an audio channel PCB Assembly. This modification must be done by Otari and is available installed on either a new or existing audio PCB Assembly.

The EECO requires a +24 VDC from the MTR-90 for power. This voltage is available from the MTR-90III External Connection PCB Assembly. To provide this voltage to the EXT. CLOCK Connector, one wire must be added.

1. Remove the rar lower panel from the machine by removing the four phillip screws securing the panel and pull out and down to remove.
2. Remove the four screws securing the External Connection PCB Assembly to the left rear lower corner of the MTR-90III frame.
3. Disconnect the ribbon and molex-type connectors from the External Connection PCB Assembly. Pay attention tot he connector number labels to insure that the connectors are replaced properly.
4. Add a piece of wire approximately 152 mm (6") long from Pin 13 of CN3 (remote connector) to Pin 25 of the EXT. CLOCK connector or to Pin 31 of the PARALLEL I/O connector.
5. Reinstall the External Connection PCB Assembly, being extremely careful not to damage any connector pins.
6. Reinstall the rear panel on the machine.

The connecting cable between the MQS Sunchronizer and the MTR-90III is shown in **Figure A-4**. The cable used should contain three runs of RG-174 or equivalent coax. If standard multi-conductor cable is being used, these three coax cables should be added to the harness.

The settings of the two sets of switches must be changed to accommodate the MZS 100 Synchronizer to the operation of the MTR-90III at 15 ips or 30 ips.

15 ips (10" or 14" reels)

Grandmother PCB	low	8
Granddaughter PCB	low	F

30 ips (10" or 14" reels)

Grandmother PCB	low	4
Granddaughter PCB	M	F

Please refer to the EECO MQS 100 Synchronizer operation manual for the location of an dinformation regarding these switches.

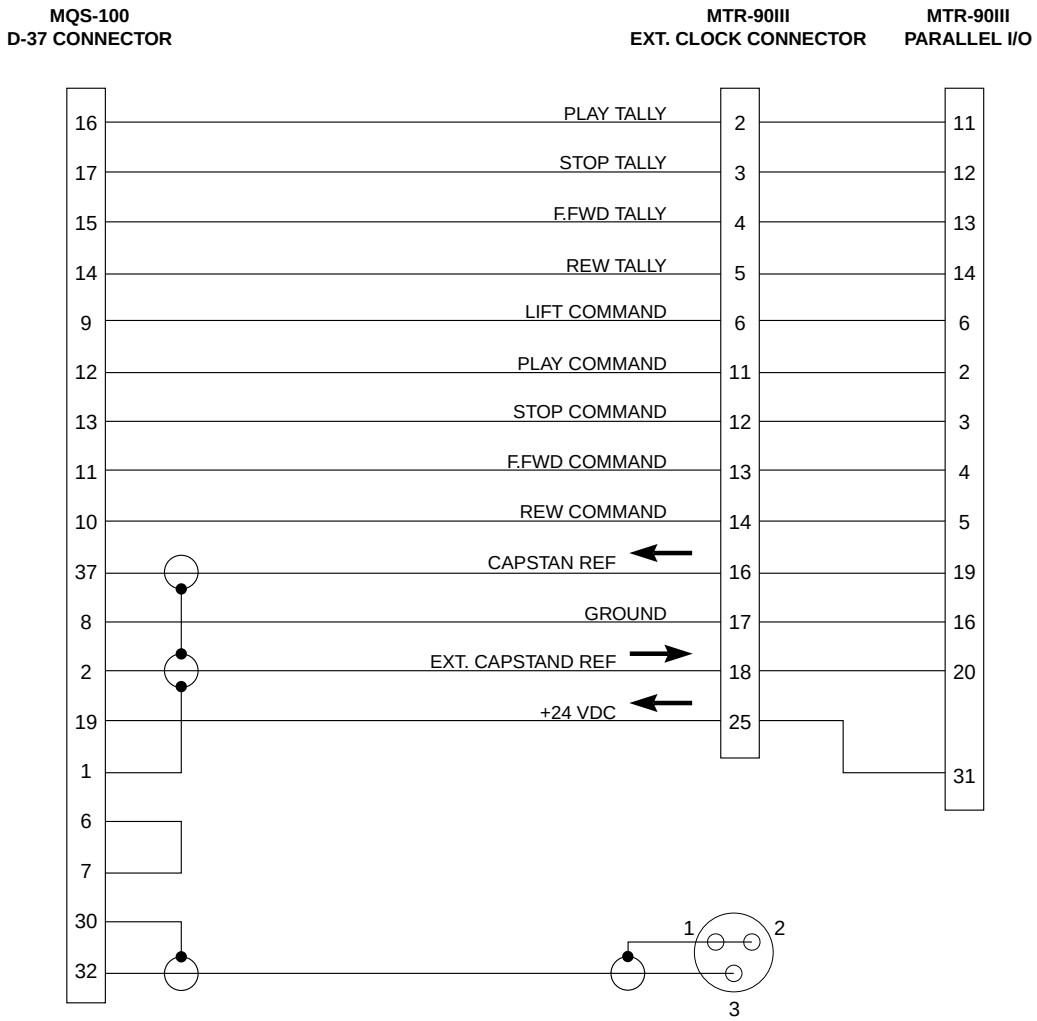


Figure A-4
EECO MQS 100 Synchronizer Connection

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